UNITED STATES ARMY

HEALTH CARE STUDIES AND

CLINICAL INVESTIGATION ACTIVITY

A LABOR & DELIVERY PATIENT CLASSIFICATION SYSTEM BASED ON DIRECT NURSING CARE TIME

LTC Bonnie L. M. Jennings, AN, USA
LTC Ruth E. Rea, AN, USA
LTC Beverly B. Antopol, AN, USA

FINAL REPORT
HR 91-003
July 1991

UNITED STATES ARMY
HEALTH SERVICES COMMAND
FORT SAM HOUSTON, TEXAS 78234

NOTICE

The findings in this report are
not to be construed as an official
Department of the Army position
unless so designated by other
authorized documents.

* *

Regular users of services of the Defense Technical Information Center (per DOD Instruction 5200.21) may purchase copies directly from the following:

Defense Technical Information Center (DTIC)
ATTN: DTIC-DDR
Cameron Station
Alexandria, VA 22304-6145

Telephones: DSN 284-7633, 4 or 5
COMMERCIAL (703) 274-7633, 4, or 5

All other requests for these reports will be directed to the following:

U.S. Department of Commerce
National Technical Information Services (NTIS)
5285 Port Royal Road
Springfield, VA 22161

Telephone: COMMERCIAL (703) 487-4650

REPORT DOCUMENTATION PAGE

Form Approved
OMB No. 0704-0188

1a. REPORT SECURITY CLASSIFICATION Unclassified	1b. RESTRICTIVE MARKINGS
2a. SECURITY CLASSIFICATION AUTHORITY	3. DISTRIBUTION/AVAILABILITY OF REPORT Distribution unlimited; Approved for Public Release
2b. DECLASSIFICATION/DOWNGRADING SCHEDULE	
4. PERFORMING ORGANIZATION REPORT NUMBER(S) HR 91-003	5. MONITORING ORGANIZATION REPORT NUMBER(S)
6a. NAME OF PERFORMING ORGANIZATION Health Care Studies & Clinical Investigation Activity 6b. OFFICE SYMBOL (If applicable) HSHN-H	7a. NAME OF MONITORING ORGANIZATION U.S. Army Health Professional Support Agency Nursing Consultant (SGPS-CP-N)
6c. ADDRESS (City, State, and ZIP Code) Bldg 2268 Fort Sam Houston, TX 78234-6060	7b. ADDRESS (City, State, and ZIP Code) RM 603, Skyline Five 5111 Leesburg Pike Falls Church, VA 22041-3258
8a. NAME OF FUNDING/SPONSORING ORGANIZATION OTSG 8b. OFFICE SYMBOL (If applicable)	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER
8c. ADDRESS (City, State, and ZIP Code)	10. SOURCE OF FUNDING NUMBERS PROGRAM ELEMENT NO. / PROJECT NO. / TASK NO. / WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) (U) A Labor & Delivery Patient Classification System Based on Direct Nursing Care Time	
12. PERSONAL AUTHOR(S) LTC Bonnie L. M. Jennings, LTC Ruth E. Rea, LTC Beverly B. Antopol	
13a. TYPE OF REPORT Final	13b. TIME COVERED FROM Feb 1988 TO Jul 1991
14. DATE OF REPORT (Year, Month, Day) 1991 August	15. PAGE COUNT 140
16. SUPPLEMENTARY NOTATION	

17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)
FIELD	GROUP	SUB-GROUP	Nursing; Patient Classification; Labor and Delivery

19. ABSTRACT (Continue on reverse if necessary and identify by block number)

(U) This study was conducted as directed by the Army Medical Department (AMEDD) Study Board to extend the Workload Management System for Nursing (WMSN) into Labor and Delivery (L&D). The focus of the study was on nursing time spent in direct care, or that time spent performing nursing activities at the patient's bedside. By evaluating direct care time, a patient classification instrument was developed based on patient acuity. Subsquent to the AMEDD Study Board tasking, the Joint Manpower Office of the Office of the Assistant Secretary of Defense (Health Affairs) (OASD(HA)) determined that this study would be used in developing the triservice manpower staffing standard for L&D.

The study was comprised of three phases, each of which involved collecting data at various Army hospitals for analysis. In Phase I, mean times were derived for each task relevant to L&D. In Phase II, a worksheet was constructed to reflect the relevant L&D tasks. Once the validity and reliability of the instrument/worksheet were established, data were

20. DISTRIBUTION/AVAILABILITY OF ABSTRACT ☒ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS	21. ABSTRACT SECURITY CLASSIFICATION Unlimited
22a. NAME OF RESPONSIBLE INDIVIDUAL LTC Bonnie L. M. Jennings	22b. TELEPHONE (Include Area Code) (210) 221-0047 22c. OFFICE SYMBOL

DD Form 1473, JUN 86 *Previous editions are obsolete*

collected and analyzed to: 1) establish the acuity categories, and 2) derive a subset of predictors that would reflect total direct care time. Phase III consisted of three parts. First, a panel of clinical nursing experts formatted the worksheet and evaluated user instructions. Second, instrument validity and reliability were verified using the smaller set of direct care indicators. Finally, L&D nursing staff members used the revised worksheets for two weeks, and provided a critique of the worksheets.

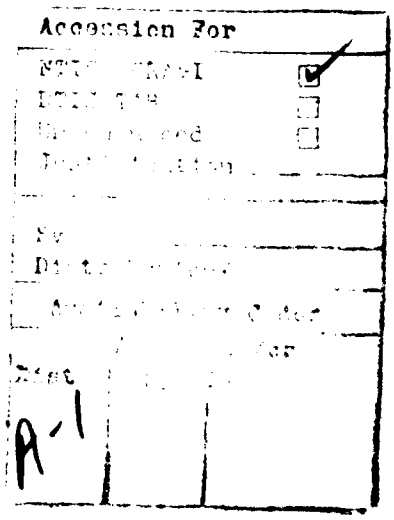
The L&D data reflected two distinct populations: Outpatients for whom there were two acuity categories and inpatients for whom their were five acuity categories. Of the direct care tasks common to L&D, four were found to be highly predictive of total direct nursing care time for outpatients and 25 tasks were highly predictive of total direct nursing care time for inpatients. These tasks also allowed a high accuracy in categorizing patients. The final acuity-based instrument reflects direct nursing care time and meets the requirements for a Type I Standard as stipulated in applicable regulatory guidelines.

The indirect care activities, that is patient care tasks done away from the bedside as well as tasks pertinent to unit management, will be investigated separately. When indirect nursing care time is derived, it can be combined with the direct care data to create a triservice manpower staffing standard and a patient classification system for L&D.

TABLE OF CONTENTS

LIST OF TABLES

TABLES Page



LIST OF FIGURES

FIGURES Page

LIST OF APPENDIXES

Page

SUMMARY

The purpose of this study was to develop a patient classification instrument to reflect patient acuity for labor and delivery (L&D) patients. The instrument is based on mean stopwatch times for tasks revelant to contemporary L&D nursing practice. A pilot test was conducted to ascertain initial psychometric properties for a preliminary worksheet comprised of 64 tasks and select patient demographic data. Concurrent validity was .87 and interrater reliability was .98 for this form of the worksheet. Given the acceptable validity and reliability paramerters, the worksheet was field tested at six facilities to collect sufficient data to establish acuity categories and derive a smaller subset of tasks that were predictive of total direct care time.

In the process of establishing the acuity categories, it became apparent that inpatients and outpatients represented two different populations within L&D. These data were therefore analyzed separately both to establish the acuity categories and to derive the predictor subsets. There were five acuity categories for L&D inpatients and two distinct acuity categories for L&D outpatients. The predictor subsets for both inpatients and outpatients were derived using sequential regression models to find the solution that best accounted for direct care time and allowed easy implementation in the clinical setting. The final inpatient model was comprised of 25 variables that accounted for 97% of direct care time; the final outpatient model was compromised of 4 variables that accounted for 82% of direct care time. The outpatient model represents a choice that balanced capturing direct care time and ease of use in the clinical arena.

The worksheet was then revised based on the subsets of predictor tasks, and instrument validity and reliability were verified. The psychometric properties remained highly stable and satisfactory: Concurrent validity was .86 and interrater reliability was .98. Consequently, based on a blend of scientific rigor and clinical considerations, a valid and reliable patient classification instrument reflecting total direct care nursing time in L&D was developed.

ACKNOWLEDGMENTS

This investigation could not have been completed without the assistance of innumerable staff members from L&D units throughout the AMEDD who helped with various aspects of data collection. In addition, there are several individuals who contributed substantial time by assisting with critical decisions and tasks throughout the study. Although the majority of the contributors will remain anonymous, a few individuals will be mentioned by name for their assistance with facets of the study as identified:

Preliminary tool evaluation:

LTC Valerie Biskey, LTC (ret) John Coventry, MAJ Susan Fox, LTC Mary King, LTC Patricia Rikli, LTC K.C. Shinners, LTC Diana Stepanik, LTC Barbara Turner, LTC Cheryl Vaiani;

Expert panel for task identification, evaluation and operational definitions:

LTC Debbie Bopp, LTC K.C. Shinners, MAJ (ret) Patrice Steinbrueck, LTC Cheryl Vaiani;

Timed data collection:

Ms. Sue Akins, LTC Valerie Biskey, LT Sheri Melton, CPT Pamela Murdock, LTC Elise Roy, COL Clifford Simons, LTC Diana Stepanik, Ms. Pat Twist, LTC Cheryl Vaiani;

Critique of draft worksheet and operational definitions:

The 42 nurse participants of the August 1988 OB-GYN Nursing Conference held at Fitzsimons Army Medical Center;

Field test coordinators:

LTC Margaret Baird, LT Lisa Bishop, MAJ Pat Cefaly, MAJ Carolyn Daviau, CPT Flavia Diaz, MAJ Marilou Fischer, COL Zula Johnston, MAJ Elizabeth Middlestaedt, LT Laverne Moore-Washington, LTC Janice Oldridge, LTC Cheryl Wedeking;

Expert panel for worksheet formatting and instruction evaluation:

LTC Margaret Baird, MAJ Pat Cefaly, MAJ Carolyn Daviau, MAJ Marilou Fischer, LT Laverne Moore-Washington, LTC Cheryl Vaiani;

Site coordinators for the user critique:

LTC Margaret Baird, MAJ Pat Cefaly, MAJ Carolyn Daviau, MAJ Marilou Fischer, LT Laverne Moore-Washington, LTC Janice Oldridge.

In addition to the above mentioned individuals, our sincere gratitude is extended to the nursing staff members at all facilities used in the various data collection efforts. This study could not have been completed without their conscientious involvement and willingness to assume additional responsibilities.

We are also extremely grateful for the thoughtful critiques of earlier drafts of the manuscript provided by both LTC Claudia Bartz and LTC Jane Hudak. Their professional reviews contributed substantially to the clarity of the final version of this report.

Finally, we wish to acknowledge the inestimable contribution provided by our statistical consultant, Dr. Sondra Perdue. Dr. Perdue's indepth understanding of statistical issues and approaches balanced with her awareness of clinical nursing practice allowed for sound guidance through all phases of this study.

INTRODUCTION

Purpose

As tasked by the Army Medical Department (AMEDD) Study Board, this investigation was conducted to extend the Workload Management System for Nursing (WMSN) into Labor and Delivery (L&D). The study was originally intended to apply to the Army. When the manpower staffing standards program moved to the triservice arena, however, the study's scope was expanded to include the Navy and Air Force. This study focused only on direct nursing care which, in keeping with similar investigations, was defined as the patient care provided at the bedside. The purpose of this study was to develop a patient classification instrument for L&D based upon quantified direct nursing care times that reflect patient acuity.

Separate investigations are in progress to evaluate indirect care in L&D. Indirect care reflects patient care support activities that occur away from the bedside (e.g., pouring medications and charting) as well as activities related to unit management. By combining the findings from the direct and indirect care studies, a triservice manpower staffing standard can be developed.

Background

During the late 1970s, the nursing community identified a need to determine staffing in an objective, quantifiable manner. To satisfy that need, Patient Classification Systems (PCSs) were developed. The primary purpose of the PCS is to assess patient needs based on nursing care requirements. Quantifiable direct care time based on patient acuity can be combined with other time components (e.g., indirect care time) to indicate the total nursing care hours required based on workload. Staffing decisions can

then be made based on objective data that reflect the variable demand for nursing care (Giovannetti, 1978, 1979; Lewis, 1988; Thompson & Diers, 1988).

In response to the need to base staffing on quantifiable data, the Army Nurse Corps (ANC), in conjunction with the Navy Nurse Corps, developed a PCS known as the WMSN (Lensing, 1987; Misener, Frelin, & Twist 1983, 1987; Reider & Jackson, 1985; Reider & Lensing, 1987; Sherrod, 1984; Sherrod, Rauch, & Twist, 1981; USAMARDA, 1986; Vail, Morton, & Rimm, 1987). Although the WMSN captures patient acuity information for most types of inpatient nursing units, it does not reflect tasks common to the L&D patient population. Nursing tasks involved in the care of L&D patients are sufficiently unique to necessitate a separate patient acuity instrument.

The absence of a PCS for L&D showed a significant gap in determining required nurse staffing. At the onset of this study, live births/month were used to determine nurse staffing (DA Pam 570-557). This unit of workload measurement assumes that all live births require similar nursing care. Such an assumption is as erroneous as believing that all patients have similar nursing care needs (Lewis & Carini, 1986). Using live births/month as a measure to guide staffing does not consider the workload associated with antepartal patients, maternal complications, fetal demise, post-delivery recovery, or outpatient care provided in the inpatient setting. Major technological developments that occurred over the past decade also effect the nursing care required by L&D patients. Electronic fetal monitoring, invasive procedures, and operative procedures performed within L&D are representative of the more sophisticated care delivery that is common to L&D today.

Prior to commencing this study, existing PCSs pertinent to L&D were identified and evaluated from both psychometric and clinical perspectives. There were five criteria used to guide this evaluation. First, the measured nursing activities needed to be operationally defined and as free from subjective interpretation as possible. Second, the instrument needed to be based upon a factor evaluation method (objective) rather than a prototype evaluation approach (subjective) (Aydelotte, 1973; Giovannetti, 1978; Lewis & Carini, 1986). Third, the instrument needed to reflect the domain of direct nursing services (tasks) provided in the L&D setting, to include outpatient care and post-delivery recovery. Fourth, data had to be available to support claims of acceptable instrument reliability and validity. Finally, the instrument needed to be easy to use.

Existing L&D patient classification instruments from the civilian community, representing both those developed by independent researchers and those developed by corporations were evaluated based on the five evaluation criteria (Ernst & Whinney, no date; Freitas, Helmer, & Cousins, 1987; Hospital of the University of Pennsylvania, no date; Jones & Bolton, no date; Killeen, no date; Medicus, 1987; Schmid & Gerlach, 1986). As reflected in Table 1, no existing PCS instrument met the five evaluation criteria.

Table 1

Evaluation of Pre-existing L&D Patient Classification Tools

	Classification Tools						
	Jones & Bolton	Freitas, Helmer, & Cousins	Schmid & Gerlach	Killeen	Univ. of Penn	Medicus	Ernst & Whinney
Evaluation Criteria							
Operational Definitions		Y					
Factor Evaluation Method	Y	Y	N				
Domain of Direct Care (in- and outpatient)			Y	Y	Y	Y	
Psychometric Information							
Ease of Use						Y	

NOTE. Y indicates that the tool meets the criterion; N indicates that the tool does not meet the criterion; a blank indicates that there was insufficient information available to evaluate the criterion.

Consequently, the existing WMSN was used as a guide to develop an L&D PCS instrument to measure direct care. It is important to reiterate that this study is only one part of the final product. A meaningful staffing standard and patient classification system will not exist until the findings from the direct study are coupled with the findings from the indirect study.

The previous work of Sherrod, Rauch, and Twist (1981) provided a solid basis for designing and conducting this direct care study. Using a factor evaluation approach, Sherrod et al. conducted an extensive study of direct

care nursing activities. Each of 357 tasks, including tasks specific to L&D, was operationally defined and timed. The L&D component was not, however, incorporated in the original WMSN. Therefore, when the WMSN was implemented, there was no mechanism to capture patient acuity data specific to L&D. By building on the existing data from the Sherrod study, an acuity instrument could be developed that met the previously stated evaluation criteria.

The original measurements from the Sherrod et al. (1981) study are still relevant for the most part. However, because nursing practice in L&D has changed over time, the L&D elements of the Sherrod study do not reflect the complete domain of contemporary L&D nursing activities. A number of L&D nursing tasks that represent recent advances were neither operationally defined nor measured by Sherrod. The present study was therefore designed to develop a patient acuity instrument to measure direct care time by reflecting contemporary L&D nursing practice.

OBJECTIVES

Because of the extensive scope of this study, a number of objectives were developed to ensure that the investigation progressed in an orderly sequence. The objectives that follow are listed according to three study phases.

Phase I

1. Identify direct nursing care tasks relevant to L&D;
2. Measure selected tasks;
3. Derive the mean time for tasks relevant to direct care in L&D;

Phase II

4. Develop a valid and reliable instrument to reflect direct care time;
5. Establish the acuity categories relevant to L&D;
6. Reduce the number of tasks to a parsimonious but accurate subset of total direct care time predictors;

Phase III

7. Revise the instrument based on the subset of predictors;

8. Verify the validity and reliability of the revised instrument;

9. Evaluate the final instrument for ease of use.

To create the actual staffing standard, the three services will need to use this acuity instrument for several months to establish the data base from which the direct care information will be derived. These data, in combination with findings from the indirect care studies, can be used to develop the triservice staffing standard for L&D.

METHODS AND FINDINGS

Overview

The methods and findings will be addressed by referring to the phase of the study in which they occurred. Analyses were conducted for each phase of the study prior to commencing the next, as each subsequent phase of the study was derived from preceding information. The entire study was designed in consideration of military regulations governing the development of manpower staffing standards. All data were collected from L&D units within U. S. Army Health Services Command (HSC). Site selection was determined by examining workload within HSC L&D units to assure that facilities with high, medium, and low workload were represented. The study protocol was evaluated and approved by the Clinical Investigation Division of the U.S. Army Health Care Studies and Clinical Investigation Activity (HCSCIA) to assure the protection of the rights of human subjects.

This study commenced prior to the establishment of the Joint Healthcare Management Engineering Team (JHMET). In September of 1988, representatives from OASD(HA), the JHMET, and HCSCIA agreed that the methods used in this

study would be acceptable to all agencies involved. It was also agreed that it was highly unlikely that direct care times would vary among the services. Therefore, in order to expedite the study and in consideration of the AMEDD Study Board's original tasking, it was agreed that direct care measurements could be derived solely from Army sites.

Phase I Procedures and Findings

Phase I of the study began in February, 1988, and continued through August, 1988. The first three objectives were achieved in this phase of the study. Overall, this first study phase replicated the approach used by Sherrod et al. (1981).

Objective 1: Identifying Relevant Direct Care Tasks

Considering the countless tasks that pertain to health care delivery, a tenet underlying task identification was to focus on those activities that were most likely to be predictive of L&D direct care time. A complete inventory of direct care tasks in the L&D domain, also known as the Work Center Description, is at Appendix A. It was derived from the literature and clinical nurse experts in L&D.

An assessment of the inventory of tasks showed that the L&D patient care activities could be separated into four categories based on the frequency with which the tasks occurred and the time required to accomplish the task. These categories were as follows: (a) occurring frequently and involving considerable time (e.g., admitting patients); (b) occurring frequently and involving minimal time (e.g., changing peripads); (c) occurring infrequently and involving considerable time (e.g., performing cardiopulmonary resuscitation); and (d) occurring infrequently and involving minimal time (e.g., measuring abdominal girth). To reiterate, the focus of task

identification was to delineate those L&D direct care tasks that were most likely to make a significant difference in total direct care time. Therefore the frequently occurring, time consuming tasks were given careful attention, although not to the exclusion of the other tasks.

There were two mechanisms used to assure that all tasks relevant to L&D direct care time were considered. Source documents such as the Sherrod et al. (1981) study and a report from the Navy (Bussey & Warren, 1987) were reviewed. In addition, a group of L&D clinical nursing experts was consulted to verify the completeness of the task identification.

Source Documents

In reviewing the Sherrod et al. (1981) study, two groups of tasks relevant to L&D were identified; those specific to L&D (e.g., fetal monitoring) and those general tasks that pertain to clinical nursing practice regardless of specialty (e.g., making a bed) (Appendix B). The general tasks were critiqued and regarded to be sufficiently complete. The tasks specific to L&D, however, were updated to reflect current L&D nursing practice. A report from the Naval School of Health Sciences was extremely useful in this process (Bussey & Warren, 1987). Based on information from the source documents, a list was compiled of all L&D specific direct care tasks believed to reflect current L&D nursing practice. The list of the L&D tasks was then submitted to the clinical experts for review.

L&D Clinical Nursing Experts

The list of L&D specific tasks was distributed to four L&D clinical nurse experts from the ANC who had a threefold responsibility. First, they determined whether each task reflected an L&D nursing activity and thus represented a possible predictor of direct care time. Second, they determined

if tasks needed to be added to the listing to fully reflect the scope of inpatient and outpatient L&D care. Finally, they determined whether the operational definition for each task accurately reflected the specified task. The tasks reviewed by the L&D experts are listed in Appendix C.

The L&D clinical experts received the list of tasks in the mail. The principal investigator conducted a telephone conference with the L&D clinical experts to reach a consensus regarding which tasks needed to be kept on the list, which tasks needed to be added, and which tasks required modifications in their operational definitions. The results of the critique by the clinical experts are summarized in Appendix D. Overall, the experts agreed that of the 56 tasks, 18 could be eliminated. The reasons for elimination were that the tasks were: (a) outdated, (b) beyond the scope of routine nursing practice, (c) combined with other tasks, (d) redundant with one another, (e) better measured by their individual elements, or (f) captured in a proxy measure.

The logic for eliminating tasks was derived from a conceptual analysis. As stated previously, although some tasks are done frequently, they take very little time to complete; it is therefore cumbersome to mark these tasks each time they are done. Furthermore, many tasks could be captured by considering them in a larger context. For example, changing a peripad is done often, but it is easier to capture this task by combining it with the various activities completed as part of ongoing recovery room assessment. Similarly, newborn care is done during delivery room care regardless of whether it is a vaginal delivery or a Cesarean section.

Some tasks listed such as fetal distress and preeclampsia/eclampsia were actually diagnoses rather than nursing activities. The diagnosis-based tasks were shifted to a task focus. For example, common tasks performed during

fetal distress include administering oxygen, changing position, and changing the flow rate on intravenous infusions. Therefore, it was important to have these individual tasks listed because they reflect what nurses do to meet patient needs during situations such as fetal distress.

The task list presented to the clinical experts was also reviewed to determine if any pertinent tasks needed to be added. Some tasks such as arterial line maintenance and pulmonary artery pressure monitoring, were done infrequently and only in select facilities. Other tasks that concerned the clinicians, such as accompanying patients to other facilities or transporting patients to other areas of the hospital, will be captured in the indirect study. There was also deliberation regarding the care required of high risk antepartal women admitted to L&D. The experts agreed that the tasks involved in caring for these women were already listed. Despite considerable discussion, only two tasks were added to the list (Appendixes C and D).

Finally, the clinical experts reviewed the operational definitions for each task. For the tasks derived from the Sherrod et al. (1981) study, the definitions were reviewed to determine whether they remained sufficiently descriptive of the task. This was important; the operational definitions used for the tasks needed to be as accurate as possible. If the task name was the same as that used in the Sherrod et al. study but the essence of the task had changed considerably, the task would need to be remeasured. Definitions from the Sherrod et al. study were accepted by the clinical experts with only minimal rewording to enhance clarity. There was no task that had to be remeasured due to changes in definition. A similar procedure was followed for the tasks that were adapted from the Bussey and Warren (1987) report, with no major changes in the operational definitions. Finally, the clinical

experts also constructed operational definitions for the two added tasks.

The tasks and operational definitions derived from the consensus of the clinical experts were sent to a Navy nurse at the Naval Medical Data Services Center in Bethesda, Maryland and the nurse consultant to the Army Surgeon General for OB-GYN nursing. Both of these individuals concurred that the listing represented the domain of inpatient and outpatient L&D nursing practice and that the operational definitions were acceptable.

The first study objective was met with the completion of the list of the 40 L&D specific tasks believed to have potential predictive ability of direct care time. These tasks, with their operational definitions, can be found in Appendix E. Congruent with previous work, each task was numbered. Tasks in the 2400 series had been measured in the Sherrod et al. (1981) study, whereas tasks in the 2800 series had not been measured by the Sherrod group.

In sum, source documents and a panel of L&D experts were used to develop a list of L&D tasks that both reflected the domain of contemporary L&D practice and constituted the best potential predictors of total direct nursing care time. This latter point was essential to avoid focusing on either repetitive but excessively brief tasks or time consuming but infrequently occurring tasks.

Objective 2: Measuring Selected Tasks

The second objective for Phase I involved measuring selected tasks. These measurements included both reassessing task times from the Sherrod et al. (1981) study and measuring tasks that had not been timed previously. Fundamental to decisions regarding measurement was a careful analysis of the statistical parameters of the L&D tasks found in the Sherrod et al. data.

Selecting the Tasks

Tasks that had been measured in the Sherrod et al. (1981) study were assessed based on statistical, scientific, and pragmatic criteria to determine whether enough observations had been collected. Confidence intervals (CIs) of 80% and 95% were constructed for each of the relevant Sherrod tasks. Lengths of these CIs were examined to assess the precision of the Sherrod estimates. Acceptable precision, as measured by CI, was based on scientific judgment considering the practice setting and the requirements of the instrument being developed. It was not reasonable in the clinical setting to use a fixed criterion for all tasks or to use a strict statistical computation. Whenever practical, 95% CI lengths were used. In light of practical cost-benefit concerns, 80% CI lengths were judged to be acceptable as precision estimates for tasks that were more difficult to sample.

In general, tasks with fewer than 30 observations in the Sherrod study were remeasured. Achieving 30 observations/task not only follows from the preceding assessment, but Sherrod also targeted 30 observations/task as the goal. In this study, exceptions to gathering 30 observations/task were made for tasks with acceptable precision despite the smaller number of measurements. Through this process, it was determined that there were 10 L&D tasks from the Sherrod study that needed further measurement. Various statistical parameters for the Sherrod data can found in Appendix F.

It is important to note that the values in Appendix F include reference to n', or the sample size that would assure very stringent precision of the time data. The value for n' corresponds to a 95% confidence length and was calculated using formulas in Table 15-1 of Air Force Regulation 25-5 dated 16 May 1988 (page 251). For most tasks, the projected sample size or n' exceeds

the actual sample size. The large projected sample sizes result from the considerable variance found in most health care tasks. Such variability is the norm for health care. Whereas the degree of precision in tooling a screw or other products from a manufacturing setting must be extremely high, the same degree of precision in individual tasks can neither be expected nor is it needed in the health care setting. Consequently, while the larger sample sizes are noted, they are impractical from a cost standpoint and unnecessarily strict given the health care setting to which they apply.

Along with evaluating statistical parameters to establish which tasks needed to be measured, comments from L&D nurse clinicians indicated the need to evaluate two additional tasks from the Sherrod et al. (1981) study--routine delivery room functions (number 2415) and observation and assessment, second stage of labor (number 2453). It was believed that both of these tasks needed to be re-evaluated based on the patient's parity (number of viable deliveries). The L&D clinicians also suggested assessing routine delivery room functions depending upon whether the delivery was uncomplicated or complicated; Cesarean sections were a subset of complicated deliveries. Therefore, evaluating types of delivery also allowed for determining whether vaginal and Cesarean deliveries needed to be considered separately. Consequently, a total of 12 tasks from the Sherrod et al. report were remeasured.

The L&D clinical nurse experts identified 18 additional tasks not previously measured by Sherrod et al. (1981) as potential predictors of direct care time. In the absence of any variance estimates for these unmeasured tasks, a target sample of 30 observations per task was set; this sample size generally provided adequate precision in previously measured tasks. The tasks

timed in this study are listed in Appendix G. The 12 tasks from the Sherrod et al. study are in the first column and the 18 newly identified tasks appropriate to the domain of current L&D practice are in the second column.

Measurement Techniques

There were two measurement techniques used in this study: record reviews and stopwatch timings. Times for two of the 30 tasks were derived from a review of records rather than directly observing and timing the tasks. Most tasks were observed by trained data collectors who used stopwatches to time the tasks.

Record review. A review of records was used to establish times for the types of delivery and second stage labor. Several reasons supported this approach to measurement. First, the clinical experts agreed that the continual presence of at least one nursing staff member is the acceptable standard of care during second stage labor. Professional practice standards also advocate the presence of at least two nursing staff members during a delivery (Brand & Cefalo, 1988; NAACOG, 1988). Consequently, rather than timing each of the discrete tasks comprising second stage labor or delivery, the events in their entirety could be timed.

Second, because of the considerable time usually involved with second stage labor and delivery, times could be gathered more efficiently by retrieving them from records rather than direct observation. A third advantage in using records for data collection was that it insured that all variations of delivery and parity were considered. In other words, the data did not merely reflect the variations presented during the data collection period. Rather, the computer selection of records assured that sufficient cases of uncomplicated and complicated deliveries representing both

nulliparous (never having given birth to a viable infant) and multiparous (having had two or more pregnancies that resulted in viable fetuses) women were reviewed to determine whether variations in any of these variables affected delivery time.

To identify the records for review, staff from the U. S. Army Patient Administration Support and Biostatistical Activity (PASBA) were given a list of codes pertinent to L&D from the International Classification of Diseases 9th Revision Clinical Modification (ICD-9-CM). A stratified random sample of the various types of delivery and parity was drawn based upon the relevant ICD-9-CM codes. For the data derived from patient charts, a random subset was rechecked by an independent data collector to verify that information had been extracted accurately.

Stopwatch timings. Other than second stage labor and delivery, all other tasks were timed using time and motion study techniques to capture events as they occurred in the clinical areas. More specifically, trained personnel used stopwatches to measure the time required to complete each of the remaining 28 tasks. Information concerning potentially confounding variables was also gathered. For example, it was possible that pregnancy or delivery complications, medications, anesthesia type, or patient age might alter the required task time in some manner. In addition, so that the information would be available for constructing the staffing standard, an annotation was made regarding the number of nursing personnel involved in the task and the level of their preparation (e.g., registered nurse, licensed practical nurse, nursing assistant).

Prior to data collection, interrater reliability was established to assure accuracy of the data. All individuals involved with timing underwent

training sessions to familiarize them with the clinical areas, the tasks being timed, the operational definitions of the tasks, the data collection forms, the stopwatches, and the appropriate method to conduct the timings. This latter element was necessary to assure that the timers considered other factors that influenced the times. For example, the timers stopped the watches if the careprovider left the bedside and resumed timing when the careprovider returned. Similarly, to assure that the times reflected the total number of nursing careproviders involved with the task, each timer used more than one stopwatch for each task measurement. If two careproviders were involved with the task, two watches were used in the timings; they were started and stopped to reflect the time the individual careproviders were at the bedside. The time for each careprovider was recorded on the data collection form. The total time used in the analysis was the sum of the time of all careproviders involved with the task.

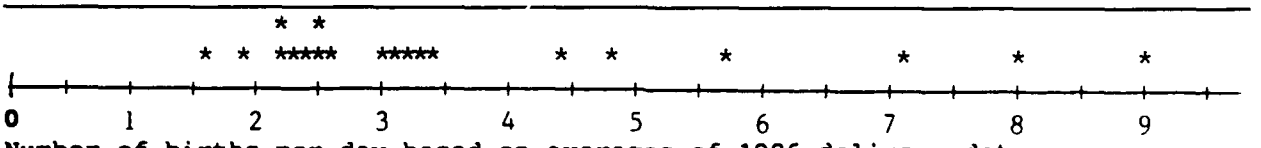
Reliability among timers was assessed using representative tasks from two task subsets. The first subset reflected tasks completed by a single careprovider and the second subset represented tasks completed by multiple providers. The interrater reliability coefficients for the timing training sessions, based on 14 measures per rater, ranged from .92 to .99. This high level of reliability is important as it verifies that the tasks were measured consistently among observers thereby minimizing variance due to measurement error.

Entrée

Access to the data collection facilities was achieved in coordination with the Office of the Chief of Staff, U. S. Army Health Services Command. Data collection sites were selected based upon the workload distribution

reflected in the univariate scatterplot found in Figure 1. It was important to gather data from institutions with high, medium and low workload to make comparisons among facilities. The naturally occurring gaps in the distribution delineated high (> 6.5 births/day), medium (> 4.0 and < 6.5 births/day), and low (< 4.0 births/day) workload. The overriding consideration, however, was to gather data from institutions that were sufficiently busy so that the desired number of datapoints could be collected at each site within a reasonable period of time. To the extent possible, as previously explained, the goal was to collect 30 measures of each task at each site.

Figure 1. Univariate scatterplot of L&D workload distribution throughtout U.S. Army Health Services Command facilities.



Number of births per day based on averages of 1986 delivery data.

Note. Each point represents the number of Health Services Command facilities that, on the average, had the indicated number of births per day in 1986.

Based upon a cost/benefit assessment, measurements were collected during two-week periods at each of four sites. To achieve a desirable sample size during the established data collection period, two sites were from the high workload strata. Data were also collected from one facility with medium workload and one facility with low workload both to contribute to task sample size and to allow interfacility comparisons based on variation in workload. There were fewer measurement opportunities at the facilities with lower

workload. The limited data collection timeframe was deemed appropriate, nevertheless, considering costs and benefits.

Furthermore, for selected tasks, the HCSCIA data were pooled with Sherrod et al. (1981) values to increase the total sample size. By combining the Sherrod et al. sites with those used in the present study, the mean times for L&D tasks were actually derived from data collected in a total of 12 Army medical treatment facilities.

Data Accuracy

Once the data were collected, two strategies were used to ensure data accuracy prior to analysis. First, the data collection forms were scrutinized to verify that all information was available and that any questionable notations were clarified with the individual data collectors. Second, computer entry of the data was accomplished by trained key entry operators who entered and verified each data point. It was then possible to begin the analysis to derive the mean times.

To reiterate, 30 tasks were measured to achieve the second objective of the present study. Of the 30 tasks, 12 were from the Sherrod et al. (1981) investigation and 18 were newly identified tasks (Appendix G). Data collectors were trained in the appropriate data gathering techniques, and interrater reliability was established. Measurements were derived primarily based on time and motion study techniques using stopwatches. For two measures--second stage labor and delivery--data were retrieved from hospital records. By combining the current data with measurements from the Sherrod et al. report, a total of 12 Army medical treatment facilities were represented.

Objective 3: Deriving Mean Times

Preliminary Analysis

Prior to calculating mean times, data were examined from a variety of perspectives to assure that all calculations would be derived from a credible data base. Overall, three purposes guided the preliminary analysis: (a) evaluating the distributions for outliers, (b) examining whether there were variations among sites, and (c) ascertaining whether additional variables such as age or parity might need to be taken into account to adjust for differences in times.

Because time typically does not conform to a normal distribution, the evaluation for outliers was conducted after applying an inverse transformation to time. In this way, it was easier to decide whether measurements were truly outliers to be eliminated or merely extreme but real values. There were no times, either low or high, that were interpreted as actual outliers. In a few instances there were rather low or rather high values with low frequency of occurrence. Nevertheless, in all cases, clinical explanations could be provided to account for these instances. It was believed, therefore, that the values did represent the reality of clinical practice and should thus be allowed to effect the overall mean values.

Variations among sites were examined because it has been suggested that times for tasks vary between teaching hospitals and nonteaching hospitals. An analysis was conducted to discern whether empirical evidence would support the assertion. The findings would have to be especially dramatic, however, to warrant site by site consideration for the final instrument. Because this system will be used by all services in all hospital types, the fit for any individual site may be less than ideal. The overriding focus was

to develop a measure of direct nursing time that would generally meet the needs of many facilities rather than specifically meet the needs of a few treatment centers.

Only six of the 30 tasks demonstrated a statistically discernible difference among sites. Of these, two of the tasks (numbers 2808 and 2815) were dropped from further use because they were infrequently occurring and the time involved was minimal. More importantly, no statistically discernible differences existed for 24 of the 30 tasks. This was a highly encouraging finding and supported the applicability of these findings across the military health service system. Overall, the facilities are more alike in time to complete tasks than they are different. Furthermore, it is possible that differences are more linked to the clinical expertise of the provider than to specific facilities.

Finally, the effects of potentially confounding variables were examined for all 30 tasks. Examples of possible confounding variables are age, gravida, parity, and coexisting medical problems (e.g., hypertension, diabetes). Where appropriate, anesthesia type was also evaluated.

There were only two tasks in which time appeared to be altered by confounding variables. For task 2820, admission to recovery room post delivery, it was clear that anesthesia type made a difference in time. In the analysis of variance for recovery room admission based on anesthesia type, there was a statistically discernible difference between general anesthesia and local anesthesia ($p = .0003$). Consequently, anesthesia type was evaluated further to assure that its effects were properly identified in the instrument/worksheet.

Delivery was the other task for which confounding variables needed to be considered. For both vaginal delivers and Cesarean sections, the time for delivery was affected by gravida. In addition, time varied for vaginal deliveries depending on whether they were uncomplicated or complicated (e.g., breech presentation without mention of version, secondary uterine inertia, immediate postpartal hemorrhage). The effects of these confounding variables provided important information that was used in developing the instrument/ worksheet.

Conceptual and Empirical Analysis

Once the preliminary analysis was complete, various conceptual and empirical decisions were made based upon an understanding of the clinical area. These decisions are detailed in Appendix H. Overall, tasks were managed in one of four ways: (a) left as a single indicator as timed, (b) combined based on conceptual and empirical evidence, (c) divided based on conceptual and empirical evidence, or (d) deleted from further consideration and use. It was also essential, for historical purposes, to note where tasks had been miscoded.

It was imperative to combine tasks where possible to limit the number of potentially predictive tasks thereby making the instrument/worksheet easier for the clinical staff to use. Medication titration (tasks 2810) exemplifies task combination. Regardless of the medication in use (e.g., pitocin, ritodrine, magnesium sulfate), there were no statistically meaningful differences in the time involved to titrate medications. When any medication was titrated in L&D, a similar set of tasks related to maternal/fetal assessment was accomplished. Similarly, there were not appreciable differences related to initiating titratable IV medications or adjusting the

medication after it had been initiated. Therefore, a generic task entitled IV medication titration was used rather than different tasks for each drug or initiating or adjusting the medication.

The division of tasks primarily concerns deliveries. There were differences based on gravida, thus making gravida an important indicant on the instrument/worksheet. The generic task, delivery, was also subdivided to assure that each delivery type (e.g., vaginal, uncomplicated; vaginal, complicated; Cesarean section, scrub and circulate; Cesarean section, scrub or circulate) could be selected as a possible predictor of total direct care nursing time.

Tasks were deleted for various reasons as noted in Appendix H. Task 2806 (teaching, fetal movement count), for example, took only 25 seconds on the average. Because it was highly unlikely that a task of this brief duration would be a predictor of total direct nursing time, it was deleted. Task 2421 (Oxytocin Challenge Test, OCT) was also eliminated; it was not reasonable to use a mean time for the task as the variation among patients was considerable. The nursing tasks inherent to this procedure are actually reflected in task 2810 (IV medication titration). Therefore, instructions for using the instrument will inform the staff to mark the various relevant tasks on the worksheets as they are accomplished during an OCT. The statistical parameters for all tasks timed by HCSCIA are reported in Appendix I.

While the single indicator tasks are self-explanatory, it is essential to mention that some of these tasks were combined with values from the Sherrod, et al. (1981) study. Where possible, tasks with small sample sizes from either Sherrod et al. or from HCSCIA were combined using a weighted formula. In this way, stability of the mean times was improved. Weighted means were

derived for a total of six tasks. These tasks and the computational formula are presented in Appendix J.

Phase II Procedures and Findings

Phase II of the study overlapped with Phase I, commencing in August 1988, and concluding in May 1989. Study objectives four through six were achieved in Phase II. Objective 4 was to derive a worksheet listing tasks that, when combined with task times, would yield an acuity instrument reflective of total direct care time in L&D. This instrument was developed and tested for validity and reliability. Objective 5 entailed determining acuity categories for L&D patients. The purpose of Objective 6 was to identify a predictive subset of tasks. The critical factors guiding Phase II were accuracy of both predicting total direct care time as well as classifying by category; parsimony to select the fewest possible best predictors; and ease of use by the staff, with accuracy being the overriding concern.

Objective 4: Instrument/Worksheet Development

Initial Tool for Measuring Total Time

In developing the instrument/worksheet to measure total direct nursing care time in the clinical setting, several conceptual decisions were made. These largely concerned how to integrate the L&D specific tasks and general nursing tasks that reflected direct care. Rather than have a lengthy list of individual tasks, tasks that were commonly done in conjunction with one another were integrated on the worksheet. The derivation of mean times for each task on the worksheet based upon the integration process is reflected in Appendix K while the worksheet itself is in Appendix L.

To verify content validity and acceptability of this integration process, the initial worksheet was reviewed by all the study investigators, the

OB-GYN nurse consultant to the Army Surgeon General, and the 42 participants of the 1988 OB-GYN nursing conference. Both Army and Navy nurses attended the conference. The conference attendees provided written evaluations of the worksheets and the task operational definitions. These evaluations included responses to established questions that were rated on a 5-point Likert scale as well as responses to open-ended questions. The mean of the quantifiable evaluation ranged from 4.30 to 4.65, thus indicating that the conference participants found the worksheet to be complete and appropriate to the domain of L&D nursing. The main concern expressed by the OB-GYN conference participants related to needing assurance that emotional support and teaching were adequately captured. This raises an important point.

The high degree of ambiguity in many nursing procedures makes it difficult to capture the true essence of the task by using industrial engineering methods. Furthermore, the thinking and evaluating that are inherent to all nursing functions may or may not be reflected in the time that is needed to complete a particular task. Nevertheless, the time for support and teaching were measured as inherent to each task in this study. Furthermore, cognitive tasks do not all occur at the bedside, the focus of this study of direct care time. Because the staffing standard will be comprised of both direct care and indirect care components, the opportunity exists for the remaining cognitive elements to be captured in the indirect care time studies.

A user manual was developed to accompany the worksheet; it provided a reference for the clinical staff who would be using the worksheet during the data collection phase. The manual was comprised of a brief text that addressed: (a) the purpose of the manual, (b) what the WMSN is and why it was

developed, and (c) the current work to expand the WMSN into L&D and the clinical staff's role in completing the worksheets. Several appendixes were included that defined terms pertinent to the WMSN, provided general instructions for using the worksheets, presented a copy of the worksheet, listed operational definitions for each task on the worksheet, and posed various questions that the staff might have regarding completing the worksheets.

Initial Instrument Validity and Reliability

An essential part of this study was to establish instrument validity and reliability. Although there are many types of each of these psychometric properties that are improved through ongoing instrument development, this study focused on concurrent validity and interrater reliability. Through these parameters, it was possible to verify both that direct care time was being measured and that it was measured consistently among users. The importance of these psychometric properties cannot be overstated. "Without psychometric information about a tool's performance with the group of interest . . . , use of that tool may yield misleading results" (Rew, Stuppy, & Becker, 1988, p. 19).

The worksheet used in the L&D Pilot Test (Appendix L) was used in conjunction with task times to test the instrument validity and reliability. This occurred during the pilot study which took place at one facility with a busy L&D service. Each nursing staff member received a copy of the user manual prior to training sessions that were designed to teach them how to use the worksheets. The actual validity and reliability testing took place subsequent to training the staff. The goal was to follow 30 patients throughout their entire stay in labor and delivery.

The nursing staff involved with patients in the pilot test marked the worksheets to reflect the direct care tasks completed with the patients. The nurse researcher team also followed the patients in two ways. The researchers completed a worksheet identical to that used by the staff based upon their personal observations of direct care provided, and they used stopwatches to record actual total direct care time during the patient's stay. The researcher and staff worksheets were completed independently. At the end of each shift, the nursing staff passed their worksheets on to the oncoming shift, and the nurse researchers passed their worksheets and stopwatches on to a new team of nurse researchers.

The validity and reliability tests were based on three measurements: (a) actual stopwatch time of total direct care time, (b) the researcher's instrument reflecting direct care that was provided, and (c) the staff's instrument reflecting direct care that was provided. The stopwatches represented the gold standard or actual direct time for validity assessment. The instrument times were derived using the known mean time/task and the task frequencies from the worksheets. The mean task times were multiplied by the frequencies recorded for each task; these values were summed thus indicating the direct care time captured by the worksheet.

The stopwatch times were the basis of verifying instrument validity or determining that the instruments did reflect total direct time. Concurrent validity was ascertained by comparing researcher time with stopwatch time. The comparison between instruments completed by the researchers and those completed by the nursing staff allowed interrater reliability to be examined by verifying if there was consistency among users. The validity and reliability coefficients are presented in Table 2. The magnitude of the

correlation coefficients is strong evidence of the instrument's validity and reliability.

Table 2

Initial L&D Instrument Validity and Reliability

Psychometric Property	Comparison	Mean Difference	r
Concurrent validity	Watch Time with Researcher Instrument Time	72.43	0.87
Interrater reliability	Staff Instrument Time with Researcher Instrument Time	4.35	0.98

Despite the high validity correlation, systematic differences existed between the direct care time recorded by stopwatch and the direct care time reflected by tasks on the worksheet. More specifically, the instrument means were higher than the stopwatch means. This finding was anticipated because the HCSCIA researchers chose to incorporate specific standards of care into the instrument task times, particularly for delivery and second-stage labor. In this way, the desired staffing could be captured rather than reflecting only what was actually observed; actual current practice may not represent preferred practice.

The above logic was applied to all types of delivery and second stage of labor. Professional practice standards advocate having a minimum of two nursing staff members in the delivery room and one nursing staff member present throughout second stage labor. However, staffing constraints do not

always allow for the preferred standard of care to be achieved. To limit the effect of staff shortages on future staffing standards, the professional standards of care were built into the worksheet. In other words, the elapsed time for each type of delivery (except C-Sections in which a nurse only scrubbed or only circulated) was doubled to yield direct nursing time. This calculation can be found in Appendix K under deliveries.

Similarly, the elapsed time for second-stage labor was added to direct care for all women in second stage labor even if an observed staff member was not able to remain in constant attendance. The rationale for these decisions was to assure that the staffing standard would not inadvertently penalize staff by basing direct time measurements on the situation that exists rather than clinical practice as it should be.

Based upon recommendations of the nursing staff who used the worksheets, a few format changes were made to improve the ease of using the instrument. The reformatting involved only changing the arrangement of tasks on the worksheets which in turn changed the number assigned to each tasks on the sheet. The changes in numbering are shown in Appendix K by referring to the task numbers in brackets. The reformatted worksheet that was used in the subsequent Phase II data collection, known as the field test, can be found in Appendix M.

To reiterate, the instrument with its worksheet was designed and tested for validity ($\underline{r}$ = .87) and reliability ($\underline{r}$ = .98). The magnitude of the correlation coefficients verified that the instrument was a relevant measure of total direct care time and that there was consistency among users in completing the worksheets.

Objective 5: Establishing Acuity Categories

Field Test Data Collection

Based upon the data analysis plan, it was estimated that approximately 1500 usable worksheets were needed to support the statistical tests to establish acuity categories and reduce the tasks to the fewest best predictors of direct time. To assure that adequate data were collected, six hospitals representing high, medium, and low L&D workload, based on the scatterplot in Figure 1, were selected from U.S. Army Health Services Command facilities as data collection sites. There were two sites representing each of the three strata.

Instrument worksheets and user manuals were sent to each field test site in advance of the arrival of a team of nurse researchers from HCSCIA. In this way, the staff was able to peruse the manuals and develop a beginning sense of the worksheets prior to the arrival of the researchers. The manuals were comprised of the same information that had been distributed during the pilot test, with minor modifications based on experiences during the pilot test.

The research teams stayed at each field test site for approximately three days. On the first day of the visit, classes were conducted regarding the use of the worksheets. To the extent possible, all L&D nursing staff members attended these hour-long briefing sessions. The nursing staff were given a general explanation of the project in addition to being apprised of the importance of their role in completing the worksheets correctly. To acquire the number of worksheets needed to support the data analysis, each field test site collected data on as many patients as possible for three months. The completed forms were mailed to HCSCIA on a weekly basis.

Because the understanding of the nursing staff was imperative to accurate worksheet completion, the staff were given a practical exercise to complete during the briefing session. The practical exercise involved having each staff member mark a worksheet based upon information provided in a preset, written patient scenario. This exercise was self-corrected in the session and served as a valuable catalyst for questions.

In addition, each staff member was given a second practical exercise to complete independently. The second practical exercise, based on a different written patient scenario, was returned to the nurse researchers. The researchers scored the exercise to verify that the staff members completed the worksheets within a preset range of acceptability. The range was derived from an 80% confidence interval from the mean of the pilot study data. The accuracy criterion was a way to assess reliability. The nurse researchers reviewed the worksheets with each staff member over the subsequent two days on each of two ten-hour shifts, clarifying necessary points to enhance the accuracy of data collection.

Because data accuracy was such an important consideration, two additional approaches were used to assure that the staff completed the worksheets correctly. First, about two weeks after the initial visit, one of the team members returned to each data collection site to work with the staff, answering questions and discussing issues that had surfaced while using the worksheets. Second, as a final check to verify that the staff had completed the worksheets accurately throughout the study, a third practical exercise was given to each staff member at the data collection sites and returned to HCSCIA for evaluation at the conclusion of the study. There was no evidence that staff members were using the worksheets incorrectly.

Data Management

Once the worksheets were returned to HCSCIA, they were evaluated for accuracy by ensuring that: (a) all requested information was provided; (b) the information was legible and accurate (e.g., that 12 tick marks were correctly reflected in the total column as a 12); and (c) the worksheet information made sense from a clinical perspective (e.g., that a delivery was followed by time in the recovery area). This review was accomplished by assessing each worksheet a minimum of three times with at least two different nurse researchers involved in the review.

Based upon this preliminary data cleaning, worksheets were separated into two distinct groups--those that were usable and those that were not. A very conservative rule was applied to determine whether worksheets were usable. First, no worksheet completed during the first two weeks of data collection from any site was used. This allowed the nursing staff time to learn how to use the worksheets without adding greater error to the data base. For the remaining 10 weeks of data from each site, only those worksheets that were entirely complete and did not convey idiosyncratic clinical situations (e.g., patients who had delivered but who were marked as outpatients) were considered usable. Head nurses were contacted to retrieve obviously missing information whenever possible (i.e., gravida, parity, type of delivery).

Prior to any computer entry, all responses to the open-ended continuous activities were also critically assessed. This area is noted as 8.1 and 8.2 on the worksheet in Appendix M. Overall, while innumerable specific patient situations were represented, these data reflected six categories, five of which pertained to direct care. The direct care tasks could be categorized as chaperoning, teaching, monitoring, patient support and surgery. The sixth

category represented a variety of indirect care tasks such as transporting patients to ultrasound or to the nursery to see their infants.

The indirect care tasks were not coded as they will be captured in the indirect care studies. For the most part, it was evident that the direct care tasks marked under continuous could often be captured within one of the pre-existing tasks on the worksheet. The notation of fetal distress typifies these. Some individuals wrote in fetal distress with one to one monitoring as a continuous activity. This information could have been captured by marking the individual tasks that were already on the worksheet (i.e., position change and oxygen administration). Another example concerns deliveries, which was continuous care by design. A variety of situations that fit under one of the delivery types (5.4a-5.4f on Appendix M), were annotated in the continuous area. Delivery of anecephalic with shoulder dystocia, patient in delivery room pushing for an hour and a half, and delivery of second twin in Breech exemplify these.

The overall assessment of the information in the continuous activities section was that there were no major tasks missing from the worksheet. That is, there were neither tasks that happened less frequently but took large amounts of time nor tasks that happened more frequently although consuming less time that had been omitted. Ongoing education with the staff would help to correct most of the data that had been placed in the continuous section.

An exception to the preceding statement concerns one medical center in which obstetrical operative procedures such as tubal ligations as well as dilatation and curettage were done in the L&D area. It is acknowledged that considerable staff time is spent in direct care related to these operative procedures. However, because this medical center represents an exception to

usual care practices in L&D, the operative procedures were not included as a part of the direct care time analysis. Nevertheless, because these procedures represent substantial direct care time, they could be included as an additive in the final triservice manpower staffing standard equation.

Computations of Total Direct Time from Worksheets

A Phase II computation critical to the entire analysis concerned the total time for each instrument. Each worksheet reflected the task frequencies of direct care provided within a 24 hour period starting at 0001 and ending at 2400. Patients may have been in the L&D area for part or all of the 24 hour period. Time beyond the 24 hour period was reflected on continuing worksheets, each of which reflected a new 24 hour period. The instrument's total direct nursing time per 24 hours for each patient could then be derived mathematically using the formula:

$P = \Sigma_i \, n_i \, M_i$ where

P = direct nursing time for each patient

i = 1 to 70 (tasks on worksheet)

M_i = mean time for task i (from time data)

n_i = 0 to n (from worksheet; times task i is done for each patient)

Preliminary Analysis

Data accuracy. Following computer entry, various approaches were used to assure that the raw data had been entered accurately. Logic statements were written to locate records with implausible combinations such as patients who were marked as receiving outpatient care but where admission procedure, or second stage labor, or a delivery or recovery time were also marked. In the event that length of stay (LOS) became an important consideration, illogical times were also evaluated (i.e., any time greater than 2400). Another example

of examining the data for accuracy involved pulling records based on patterns found in the raw data strings that suggested a value was missing. For those cases, the investigators went to the original data worksheets to verify that the data had been entered properly. Corrections were made as warranted.

Once the instrument times were calculated, a variety of descriptive statistics were done, many of them to gain a sense of the distribution of data through graphic displays. For example, distributions were evaluated based on time and LOS using scatterplots as well as bar charts with varying cutpoints. In addition, correlation matrices were evaluated for highly correlated variables, suggesting redundancy or multicollinearity, and for variables highly correlated with the total instrument time, reflecting strong individual predictors. Examining the correlations revealed neither evidence of multicollinearity nor tasks that were highly predictive of total direct time by themselves.

Outpatient and Inpatient Strata. Once the accuracy of data entry was verified, various descriptive statistics were computed for the 3262 usable instruments, 2401 or 73.61% of which represented inpatients and 861 or 26.39% of which represent outpatients. These inpatients and outpatients appeared to be representive of the type patients generally requiring care in L&D. The smaller sample of outpatients, however, may understate the actual outpatient workload seen in inpatient L&D areas for two reasons. First, to increase their Medical Care Composite Units (MCCUs), many facilities had developed a mechanism to admit patients for procedures traditionally done in the outpatient setting such as nonstress tests (NSTs). Consequently, the 861 outpatients represent only those patients so labeled by the nursing and medical staff. The actual number of outpatients is potentially greater when

not confounded by an attempt to capture additional MCCUs. Second, to reduce the impact of completing the worksheets, the data collection initially focused only on inpatients. Outpatient data, therefore, were collected over a shorter length of time.

The researchers believed, based upon clinical understanding, that the distributions of direct care times for outpatients and inpatients might differ. When the data were divided according to patient status, using bar charts with 60 minute intervals, there were two definite sets of outpatients and nine sets of inpatients. Scatterplots of the outpatient data subset identified two clusters of data while scatterplots of the inpatient data subset indicated a more diffuse distribution with three somewhat identifiable clusters. Realizing that outpatients and inpatients actually reflected two different populations within the L&D area, outpatient and inpatient data were analyzed separately. All subsequent steps in the analysis were completed separately for each of these patient groups.

Acuity Category Identification

Overall, acuity categories were determined separately for outpatients and inpatients by evaluating frequency distributions based on total instrument time. The findings for the outpatient population are presented first, followed by the findings for the inpatient population.

Outpatients. Direct nursing time delivered to outpatients ranged from a low of 1 minute to a high of 168 minutes. While there were several low times, to include multiple patients with one minute of time reflected, there were no individual low values that could be viewed as outliers. Because there were only three of them, the cases that exceeded 104 minutes were considered as possible outliers.

There was a clear discontinuity in the outpatient distribution between 48 minutes and 50 minutes. There was only one patient at 48 minutes, whereas the 73 patients at 50 minutes represented a noteworthy increase suggesting that something happens to boost the time. Other than this one clear cutpoint, the data were uniformly distributed thus supporting the use of two acuity categories for L&D outpatients. By using the category cutpoints of less than 50 minutes and 50 minutes or more, 53% of outpatients were in outpatient acuity Category I and 47% were in outpatient acuity Category II.

The categories of care were derived from an analysis of the final outpatient set of 854 patients. Once the categories were formed, the data were re-evaluated using univariate plots of the distributions within each category. In addition, descriptive statistics for the two outpatient categories are presented in Table 3.

Table 3

Descriptive Statistics for L&D Outpatient Categories

	Direct Care Time	
	Category 1 (1-48 minutes)	Category 2 (50-104 minutes)
Mean	28.41	59.07
Median	27	57
Mode	26	50
SD	7.62	9.30
Upper Limit	48	104
Lower Limit	1	50
n	453	401
% of Sample	53	47

Inpatients. Direct nursing time delivered to inpatients ranged from a low of 3 minutes to a high of 811 minutes. There was an evident gap between the single high extreme value of 811 and the next highest value of 662, suggesting that 811 was an outlier; it was therefore eliminated. Unlike the outpatients, there were no clearly identifiable cutpoints that could be used to distinguish the acuity categories. Using a logical analysis, the upper limit for Category I was set at 60 minutes. The remaining four categories were constructed to represent a balanced, symmetrical distribution.

As with the outpatient data set, once the inpatient categories were formed, the data were re-evaluated using univariate plots depicting the distribution within each category. Not surprisingly, considering the contiguousness of the entire inpatient distribution, the only category in which outliers were apparent was the last category, Category V. Descriptive statistics for each of the five inpatient categories are presented in Table 4.

Table 4

Descriptive Statistics for L&D Inpatient Categories

	Direct Care Time					
	Category 1 (1-60 min.)	Category 2 (61-120 min.)	Category 3 (121-240 min.)	Category 4 (241-360 min.)	Category 5 (over 360 min.)	Total
Mean	38.13	89.79	180.90	295.04	426.85	205.30
Median	41	91	182	292	408	199
Mode	60	91	226	256	401	71
SD	15.15	16.32	37.66	32.87	59.15	127.01
Upper Limit	60	120	240	360	638	638
Lower Limit	3	61	121	241	361	3
n	275	595	539	707	284	2400
% of Sample	11.5	25.0	22.0	29.5	12.0	100.0

Objective 6: Deriving the Subset of Predictor Tasks

Because the sample sizes for both the outpatient and inpatient subsets were sufficiently large, a computer-based random number generator was used to divide each of the subsets in half. In this way, one set of data could be used to test which variables were best predictors of both total time and the acuity categories, and the second data set could be used to validate the proposed regression solution. In other words, a split-half, cross-validation procedure was used to determine the best predictive model. Part of the data was used to determine the model based on predicted time; the other part of the data was used to evaluate the stability of the model based on total time. Final parameter estimates, however, were based on the combined data set for outpatients and the combined data set for inpatients once the best predictive models were derived. The combined data provided the source of the most stable parameter estimates. The basic formula used to derive all solutions was the traditional regression equation: $\hat{Y} = a + \Sigma_i b_i X_i$.

An important guide to assessing the adequacy of each model involved evaluating patients who were misclassified by predicted acuity with a subset of tasks (predicted direct care time) as compared to acuity based on the total instrument time. For example, it would be undesirable if all complex patients were placed in the wrong acuity category. A slight shift in categorization (e.g., a few Category I patients becoming Category II's and vice-versa) could be tolerated whereas a massive shift in categorization (e.g., all Category V patients being misclassified as Category III's) would be unacceptable. Therefore, careful attention was given to misclassifications as well as other statistical parameters (e.g., tolerance, significance) for any given model.

Outpatient Predictors of Direct Nursing Time

Based upon an analysis of the frequencies with which each task was done, decisions were made to guide the inclusion/exclusion of tasks that might best predict outpatient times. There were 31 tasks that were never selected in the outpatient area, and they were therefore eliminated as possible predictors. All but two tasks that were picked infrequently (i.e., less than 87% of the time) were also excluded. Overall, the infrequently selected tasks were also short in duration. The two tasks that consumed more time--amniocentesis and nipple stimulation contraction test--were kept in the original analysis despite their low frequency. After this analysis, 10 tasks remained to be considered as outpatient predictors. The tasks eliminated by each of the evaluations are listed in Appendix N as are the 10 tasks that remained for initial consideration as predictors. An explanation of the recoding of task numbers to variable labels (e.g., task 1.2 became V12) is also in Appendix N.

A series of six sequential models were examined to find the most accurate and parsimonious solution to predict direct care time as measured by the full instrument for L&D outpatients. The first regression model, as mentioned above, was comprised of all 10 candidate predictors; the final solution was comprised of 4 predictors. All of the models, which are summarized in Appendix O, were run as a test set and a validation set, both of which were examined for the adjusted R^2 as well as the accuracy of categorization. Although the first model was sufficiently predictive as well as accurate in regard to categorizing patients by acuity, each subsequent iteration of the model was considered to achieve the most parsimonious solution possible. The final outpatient model parameters are in Table 5, while the parameter estimates are in Table 6.

Table 5

Final Outpatient Regression Statistics (Test of the Model)

Source	DF	Sum of Squares	Mean Square	F Value	Probability
Model	4	215905.25	53976.06	984.22	0.0001
Error	850	46615.15	54.84		
Total	854	262519.40			

Root MSE	7.41
Dep Mean	42.76
C.V.	17.32
R^2	0.82
Adj R^2	0.82

Table 6

Parameter Estimates for Final Outpatient Model

Variable[a]	Beta Wt.	SE	Prob >|T|
Intercept	5.2753	.6804	0.0001
V22 Evaluation Exam Room	25.0396	.5998	0.0001
V516 Nipple Stimulation Contraction Test	15.6288	2.0066	0.0001
V517 Non-stress Test	26.2940	.5157	0.0001
V520 Ultrasound Evaluation	10.6964	.8343	0.0001

NOTE. As explained in Appendixes N, O, and P, the variable nomenclature (e.g., V22) is derived by converting task numbers to variable labels. For example, V22 is the variable label for task 2.2.

[a] All variables have 1 degree of freedom (DF).

Inpatient Predictors of Direct Nursing Time

Reduction of the inpatient subset was much more complicated. There was simply a greater likelihood that variables would remain applicable to inpatients. Furthermore, it was known from the outset that there would be less precision in categorizing inpatients because there were more inpatient categories, the width of the categories was considerable, and there were no strong guides for cutpoints to establish the categories. Consequently, it would be easy for a patient to be very close to the lower border of a category (e.g., Category III) and yet be represented instead on the upper end of the adjacent but lower category (e.g., Category II).

Based upon an assessment of the variables, the first inpatient model was run using 42 of the 70 original tasks. The assessment was not as definitive as that used with the outpatients, in that, as previously stated, there was simply a greater chance that the tasks were relevant to inpatient care. Nevertheless, by considering frequencies and mean time values, it was possible to eliminate 28 of the original tasks.

The inpatient subset was derived by examining five sequential models. There were 42 tasks used in the initial regression model. As with outpatients, the models were first tested on a randomly derived half of the patients and then verified on the other half. Each model, regardless of the data set represented, was evaluated for the amount of total direct care time accounted for as well as the accuracy of categorization. Each of these models is summarized in Appendix P.

It is noteworthy that the final model, comprised of 25 tasks, accounted for only 2% less variance in total time than the original model of 42 tasks. In addition, the accuracy of categorization dropped only 5%. Furthermore, no patients were miscategorized by more than one category in either direction; the percentage of high and low misclassifications were nearly equal. The final inpatient model parameters are presented in Table 7. The parameter estimates for the final inpatient model can be found in Table 8.

Table 7

Final Inpatient Regression Statistics (Test of the Model)

Source	DF	Sum of Squares	Mean Square	F Value	Probability
Model	25	37547284.27	1501891.37	3222.70	0.0001
Error	2371	1104969.84	466.04		
Total	2396	38652254.11			

Root MSE	21.59
Dep Mean	205.30
C.V.	10.52
R^2	0.97
Adj R^2	0.97

Table 8

Parameter Estimates for Final Inpatient Model

Variable/Parameter[a]		Beta Wt.	SE	Prob > |T|
Intercept		7.1717	1.1425	0.0001
21	Admission or Transfer	49.5340	1.0532	0.0001
210	Second Stage Labor	43.9393	1.3351	0.0001
211	Apply Ultrasonic/Tocotrans.	8.9275	0.7184	0.0001
31	Assisted Ambulation	6.3253	0.3980	0.0001
32	Assisted Care	28.9489	1.0216	0.0001
33	Complete Care	45.9705	3.2926	0.0001
36	Change Position	5.9517	0.2633	0.0001
37	Give Bedpan	3.2765	0.3172	0.0001
42	Change IV Bottle	4.4678	0.4627	0.0001
46	IV Med Titration	3.1727	0.2288	0.0001
54C	C-Section, Scrub & Circ.	201.9762	2.7701	0.0001
58	Insert IUPC	18.2532	1.1558	0.0001
59	Insert Both Fetal Scalp Electrode and IUPC	19.3427	1.1656	0.0001
510	Epidural Anesesthsia Administration	33.6066	1.6229	0.0001
513	Fetal Scalp Sample	14.2318	2.4949	0.0001
514	IV Med Encounter	3.9377	0.5999	0.0001
516	Nipple Stimulation	11.9420	2.6283	0.0001
517	Non-stress Test	24.4859	1.3822	0.0001
520	Ultrasound	11.8465	1.3479	0.0001
521	Urinary Catheterization	14.7516	1.0299	0.0001

Table 8 - Continued

Parameter Estimates for Final Inpatient Model

Variable/Parameter[a]		Beta Wt.	SE	Prob > |T|
72	Teach Breast Feeding	13.0480	1.9678	0.0001
GRAVCAT	Gravida[b]	10.9258	0.9510	0.0001
VSGN	Vital Signs[c]	3.6200	0.0770	0.0001
VVAG	Vaginal Delivery[d]	144.3274	1.2258	0.0001
CS1	C-Section, Scrub or Circ.[e]	117.1886	7.0207	0.0001

NOTE. As explained in Appendixes N, O, and P, the variable nomenclature (e.g., V22) is derived by converting task numbers to variable labels. For example, V22 is the variable label for task 2.2.

[a] All variables have 1 degree of freedom (DF).

[b] GRAVCAT is a categorical variable that represents gravida with gravida one in a category and those with any other value for gravida in another category. For further details see Appendix P, Second model.

[c] VSGN is the average of all vital sign variables. Details concerning it can be found in Appendix P, Third model.

[d] VVAG represents the combination of complicated and uncomplicated vaginal deliveries. See Appendix P, Fifth model for details.

[e] CS1 represents C-section deliveries involving one provider--someone to either scrub or circulate. Additional information is in Appendix P, Fifth model.

It must be emphasized that although delivery was a good predictor, it did not dominate the model. It is therefore important for the clinicians to realize that frequently occurring tasks that take less time (e.g., vital signs) may do as much or more to predict patient acuity than do the extremely time consuming tasks (e.g., delivery) that occur only once.

Phase III Procedures and Findings

Phase III of the study, which commenced in May 1989 and concluded in November 1989, focused on the final three study objectives: (a) revising the instrument/worksheet based on the subset of predictors, (b) verifying the

psychometric properties of the revised instrument, and (c) evaluating the final worksheet for clinical ease of use.

Objective 7: Instrument Revision

The instrument was revised based on the findings of the Phase II analysis. The revised instrument was therefore comprised of the subsets of predictors; four for outpatients and 25 for inpatients along with the intercept values for each. The revised worksheet, therefore, needed to reflect these predictor tasks.

A panel of expert L&D clinicians was convened to format the revised worksheet and evaluate the user instructions. More specifically, the points of contact from each of the Phase II data collection sites and the OB-GYN nurse consultant to the Army Surgeon General met in San Antonio for 2 1/2 days. While the analysis from Phase II dictated what tasks would be used on the worksheet, the clinicians decided how to arrange the tasks and other information in a manner that would be efficient and easy to use in the clinical setting.

By considering all aspects of the worksheet--from where the patient identification plate should be stamped to where items should be boldfaced or underlined to where partitioning areas with lines would enhance clarity of the worksheets--the clinical experts designed the final worksheet. The final worksheet was prepared as a single page with clear delineation as to outpatient and inpatient predictors (see Appendix Q). A simplified presentation of the weighted values for each outpatient predictive task on the worksheets is at Appendix R with the weighted values for each inpatient predictive task at Appendix S.

The same nurses evaluated the user instructions. These instructions were rewritten after critical and thoughtful consideration of what careproviders needed to know to complete the worksheets properly. The final version of the user instructions is at Appendix T.

Objective 8: Revised Instrument Validity and Reliability

The final instrument is an empirically derived, reduced subset of tasks that were part of the original instrument used in the pilot test to establish validity and reliability. Because the instrument was altered by using a subset of highly predictive tasks to represent direct care time, validity and reliability were re-examined.

Direct care times from the pilot test were used to verify the psychometric properties of the shortened instrument. This was done by recomputing validity and reliability coefficients for the patient data collected in the pilot test using weighted values to reflect time rather than the mean times that had been used previously. In addition, tasks suggested from the subset derived from the Phase II analysis were used in lieu of the original tasks. As displayed in Table 9, the instrument maintained extremely impressive validity and reliability using fewer tasks to predict direct care time.

Table 9

Verified Validity and Reliability for the Final L&D Instrument

Psychometric Property	Comparison	Mean Difference	r
Concurrent validity	Watch Time with Short Form using Researcher Time	70.29	0.86
Interrater reliability	Long Form Researcher Time with Short Form using Researcher Time	2.13	0.98

Objective 9: Evaluation of the Final Worksheet

The same panel of L&D clinical experts used to achieve Objective 7 were also tasked to teach the staff at their respective facilities about the revised worksheet forms. The staff at the seven sites then used the worksheets for two weeks after which each staff member was asked to complete and return an evaluation form. The form contained four specific statements: (a) the layout and overall organization of the form make it easy to use, (b) the visual presentation of the form makes it easy to read, (c) the guidelines for using the form are understandable, and (d) the operational definitions are understandable. There were also three summary questions: (a) What features of the form made it easy for you to use?; (b) What features of the form made it difficult for you to use?; and (c) Please note any other thoughts about the form, both strengths and weaknesses, below.

The response to the revised worksheet was highly favorable from staff at each of the sites. Overall, the responses to the four statements were strongly positive, thus suggesting that no changes were needed in either the worksheet or the user instructions. The features that made the worksheet easy to use were its simplicity and conciseness. The only difficulty cited, and it was repeatedly mentioned, was that many of the tasks done in L&D were not on the form. Consequently, the staff thought that because the entire scope of their practice was not represented their staffing needs might be underestimated.

DISCUSSION

This study was conducted in three phases over the course of two years to accomplish 9 objectives. The ultimate purpose of the study was to develop a patient classification instrument for L&D based on patient acuity. L&D staffing could then be derived based on nursing care hours as reflected by patient acuity in combination with indirect care time. The process of this instrument development has been presented in the preceding text, with highly detailed but important information appended to supplement the narrative.

Phase I

The first phase of this study encompassed three objectives. First, all direct nursing tasks relevant to the L&D arena were identified to assure that the scope of L&D practice--both outpatient and inpatient--was represented. Those tasks that were most likely to occur were given particular consideration as potential predictors of total direct care time. The possibly occurring tasks were also considered, but their infrequent occurrence made them unlikely candidates as predictors (Appendixes A, B, C, D).

Second, selected tasks were measured (timed). Many tasks from the Sherrod, et al. (1981) study were used without remeasuring; a statistical analysis suggested that their values were sufficiently precise. Some tasks from the Sherrod, et al. study were remeasured. Additional tasks that Sherrod, et al. had not identified were also measured based upon the guidance of clinical experts. Ultimately, 30 tasks were measured: 12 tasks from Sherrod, et al. and 18 tasks measured for the first time by the HCSCIA researchers (Appendix G).

The third Phase I objective was to derive the mean time for tasks relevant to direct care in L&D. Statistical parameters for L&D tasks timed by Sherrod, et al. (1981) are in Appendix F, while the statistical parameters for the tasks times by HCSCIA researchers are presented in Appendix I. The mean task times (Appendix K) were used in the L&D instruments to calculate direct nursing care time.

An important concept underlying Phase I concerns variance and how it affects the projected sample size needed for a specific level of precision. The projected sample sizes specified in Appendix F and Appendix I as n' correspond to a 95% confidence length. For most tasks, the projected sample size (i.e., n') exceeds the sample size derived in this study. As previously stated, however, the relevance of this parameter to health care is questionable.

Whereas production lines and other industrial based models can be regarded in a mechanistic fashion, there is a high degree of variability inherent to health care delivery. Stated differently, factories must assure precision in their products. A machine part needs to meet a very specific standard in order to work. Conversely, in the health care milieu, variation

is normative; there is considerable variation among health care providers as well as among patients. Therefore a different standard of precision is appropriate in health care delivery because staffing models for careproviders are fairly insensitive to small variations in time. Decisions concerning sample size for this study were based on balancing costs with both clinical reality and scientific accuracy.

Phase II

Phase II of the direct care L&D study was also guided by three objectives. The first involved developing a valid and reliable instrument to capture direct care time. Once this was accomplished, data were collected using the instrument/worksheet to achieve the remaining two Phase II objectives. These were to develop acuity categories relevant to L&D and to derive a parsimonious but accurate subset of total direct care time predictors.

This was the point at which the data set was divided into two populations, one for outpatients and one for inpatients. There were two distinct groups of data that clearly identified acuity categories for the outpatient group. For inpatients, five acuity categories were developed based upon an analysis of the data distribution. Unlike the outpatient data, there were no evident natural divisions in the data distribution that could be used to form the categories.

Categories for both outpatients and inpatients differ from those used in the existing WMSN. The rationale for this differences was to allow the data to drive the categories rather than make arbitrary divisions. While this approach creates a discrepancy in the two systems, its merit is that it assures that the categories are well-suited to the L&D area. Furthermore,

this addition to the WMSN is congruent with the existing WMSN in respect to using regression equations specific to each type of patient care unit.

The predictor subsets for both outpatients and inpatients were derived using sequential regression models to find the best solutions (Appendixes O and P). The final outpatient model was comprised of four variables that accounted for 82% of the direct care time derived from the full instrument and allowed 93% accuracy in acuity categorization. The final inpatient model was comprised of 25 variables that accounted for 97% of the direct care time and allowed 86% accuracy in acuity categorization. The regulatory parameters for a Type I Standard are compared with the findings from this study in Table 10. It is evident that the models are very stable and, except in one instance, exceed the statistical requirements specified in the regulation.

Table 10

Regulatory Parameters Compared with HCSCIA L&D Data

Regulatory Requirement	Outpatient Model	Inpatient Model
$R^2 \geq .750$	.82	.97
$V \leq .150$	.17	.11
$F_c \geq F_{.95,\ m-1,\ n-m}$ [a]	984.22 ($p<.0001$)	3222.7 ($p<.0001$)
$t_c \geq t_{.90,\ n-1}$ [b]	all $p<.0001$ [c]	all $p<.0001$ [d]

Note. Extracted from Air Force Regulation 25-5, Table 8-2, page 102 (May 1988)
[a] Equivalent to $p<.05$ for model.
[b] Equivalent to $p<.10$ for individual parameters.
[c] Details in Table 6.
[d] Details in Table 8.

More specifically, the coefficient of variation for the outpatient model exceeds the regulatory parameter by .02. The value for the coefficient of variation could be improved by increasing the variables used in the outpatient model. The small difference in the value required to achieve the arbitrary but regulatory statistical requirement, however, does not offset the clinical simplicity of the four variable outpatient model. Therefore, clinical usefulness was selected as the critical parameter rather than adherence to the statistical requirement. Stated differently, it was a situation of tradeoffs in which the practical implications and clinical simplicity outweighed statistical parameters explicated in the regulations.

There are two additional points of discussion concerning Phase II. The first relates to the need for acuity categories, and the second concerns automation support required to implement this system. Because direct care time for both outpatients and inpatients was derived from a regression formula using beta weights, it may be unnecessary to convert the continuous data into categorical data to derive staffing requirements. When the staffing standard is developed, the possibility of using the continuous data can be explored. As noted by Giovannetti (1985), nursing care time is of greater interest than acuity categories when using PCS data for staffing and other management decisions.

The use of beta weights gives impetus to move away from categorization other than for easy reliability checks or descriptive purposes, and also underscores the need to use an automated system for calculating the total direct care time: The mathematics are not complicated, but they are time consuming. It does not seem prudent to add such calculations to the role of the clinical staff. It also does not seem reasonable to have nonclinical

staff perform the calculations when they could be done more quickly and precisely using a computerized system.

Phase III

Finally, Phase III also focused on three objectives. First, the worksheet was revised based on the smaller set of predictor tasks. A panel of L&D clinical experts arranged the four outpatient tasks and 25 inpatient tasks on a single sheet of paper. The organization of the worksheet was based on creating a form that would be simple to use in the clinical setting (Appendix Q). This same panel also revised written guidelines for using the worksheet (Appendix T).

Second, using the subset of predictor tasks, instrument validity and reliability were verified. In this way, despite the reduced number of tasks comprising the final instrument, it was possible to verify that direct care time was being measured and that the measurement was consistent among raters.

Third, the revised instrument/worksheet and instruction manual were evaluated for ease of use by L&D staff members at seven sites. The response to the revised worksheet was highly favorable. However, the clinicians have a sense that staffing may be jeopardized because everything they do is not indicated on the worksheet. Because every possible task is not listed on the worksheet, they fear that too few nursing care hours are captured. DeGroot (1989) refers to this response as the 'myth of more'. "Under the 'myth of more', statistical results of validity tests are ignored, and the virtues of conceptual relevance and simplicity are denied" (p. 31). And yet, as DeGroot also states, ". . . the validity of critical indicators rests on their conceptual completeness, not their absolute number" (p. 31).

As this instrument is implemented, sophisticated marketing and education programs will be needed to allay staff concerns. By carefully tailoring instruction to address the 'myth of more', the clinical staff can become confident that fewer tasks not only make the worksheet easier to use, but also that the subset of tasks accurately predicts total direct care time.

There are two further issues to address that may be useful in developing the actual staffing standard: intensity and queuing. Intensity refers to the total direct time involved with a patient; it can be expressed as the ratio of acuity to length of stay (Thompson & Diers, 1988). Intensity increases as acuity increases relative to length of stay. For example, a hypothetical patient may be extremely ill and, in a 60 minute period, might require 360 minutes of direct care time. Multiple staff members would be involved in providing such care. A less ill patient might only require 20 minutes of direct care time in a 60 minute period. One staff member could care for several such patients. The first patient's intensity is obviously greater than the second patient's intensity. It is important that clinical occurrences of this nature be considered when translating the patient acuity data into staffing requirements.

The second issue relevant to staffing is queuing. Queuing analysis is a classic approach to deal with substantial fluctuations in workload. In labor and delivery, queuing theory might be particularly important to guide staffing standard development. This is an area in which workload is highly unpredictable. Furthermore, it is very difficult to move staff from other areas to help in L&D. As a result, L&D staff have to make adjustments within their own unit to cover the particularly busy periods. While this approach assures that the patient receives care from an L&D practitioner, it can be

demoralizing to the staff. Queuing theory may provide a staffing solution for dealing with the large workload fluctuations common to L&D.

By resourcing L&D units based on intensity and queuing, a better balance may be achieved between productivity and risk than that derived by staffing at the mean. Management engineers have created probability tables to compare staff productivity with patient risk based on various staffing ratios and patient needs (Alexander, Anneren, & Brandenburg, no date). The proper balance between productivity and risk benefits both the organization and the patient. The organization experiences a cost effectiveness benefit by reducing idle time for staff; the patient experiences a quality care benefit by having adequate numbers of L&D staff available to meet their nursing needs.

CONCLUSIONS

Based on both a scientifically defensible and clinically relevant approach, a valid and reliable patient classification instrument that reflects total direct care nursing time in L&D was developed in this study. The outpatient and inpatient variables can be used in a regression solution that exceeds the regulatory requirement in accounting for direct care time. The models assure that three key features are achieved: (a) accuracy of predicting total direct care time and classifying patients by acuity category, (b) parsimony in regard to using a small subset of predictors, and (c) ease of use by the clinical staff.

The results of this study represent a solid blend of statistical precision and clinical awareness, making the study acceptable from both a scientific and a clinical perspective. Because direct care time is not believed to vary among the Army, Navy, or Air Force, the findings of this

study are applicable to L&D nursing regardless of the particular service in which care is delivered.

RECOMMENDATIONS

First and foremost, it is recommended that the findings from this study be accepted as meeting the statistical requirements of a Type I Standard. Second, the findings should be implemented among all services to collect direct data that will be needed to develop the manpower staffing standard. Third, data derived from the instrument developed in this study should be used in conjunction with the indirect care study results to develop the triservice manpower staffing standard for L&D. Finally, it is strongly recommended that intensity and queuing be considered as possible ways to enhance the relevance of the staffing standard to meet the patient care needs for nursing care.

Other recommendations include assuring that there is a smooth transition of this information from the researchers to operations and automation staff. It is imperative that the people designated to implement this system are knowledgeable about its construction. This knowledge is essential to transmit accurate information to users in the field. If the clinical staff is ill-informed about how to use the tool, the data will lose their meaningfulness. The need for sophisticated marketing and education programs among the three services is especially important considering that the L&D PCS differs from the existing WMSN. To enhance congruence within and among the services, points of contact should be designated to improve the consistency with which questions are answered, decisions are made, and issues are addressed.

REFERENCES

Alexander, B., Anneren, M. R., & Brandenburg, E. (no date). Analysis of staffing and facility utilization for labor, delivery, and recovery room. A Report from the Center for Hospital Management Engineering. Chicago: American Hospital Association.

Aydelotte, M. K. (1973). Nurse staffing methodology. A review and critique of selected literature. (DHEW Pub. No. 73-433). Washington, D.C.: U.S. Government Printing Office.

Brann, A. W., & Cefalo, R. C. (Eds.). (1988). Guidelines for perinatal care. American Academy of Pediatrics/American College of Obstetricians and Gynecologists.

Bussey, J. P., & Warren, C. S. (1987). Operational definitions of labor and delivery nursing activities. An extension of the Workload Management System for Nursing project. (Report 4-87, July). Bethesda, MD: Naval School of Health Sciences Research Department.

Department of the Army Pamphlet 570-557. (1974). Staffing Guide for US Army Medical Department Activities. Washington, D.C.: Headquarters, Department of the Army.

DeGroot, H. A. (1989). Patient classification system evaluation. Part 1: Essential system elements. Journal of Nursing Administration, 19(6), 30-35.

Ernst & Whinney. (no date). Responses to frequently asked questions about patient classification systems and other assorted papers. San Antonio, TX 78205

Freitas, C. A., Helmer, F. T., & Cousins, N. (1987). The development and management uses of a patient classification system for a high-risk perinatal center. Journal of Obstetrics, Gynecology & Neonatal Nursing, 16(5), 330-338.

Giovannetti, P. (1985, May 15-17). Compatibility among existing patient classification systems with a nursing minimum data set. Paper presented at the Nursing Minimum Data Set Conference, Milwaukee, WI.

Giovannetti, P. (1978). Patient classification systems in nursing: A description and analysis. (DHEW Pub. No. (HRA) 78-22). Hyattsville, MD: Public Health Service, Division of Nursing.

Giovannetti, P. (1979). Understanding patient classification systems. Journal of Nursing Administration, 9(2), 4-9.

Hospital of the University of Pennsylvania. (no date). Labor and delivery procedures. Obstetrical/neonatal nursing department. Philadelphia, PA.

International Classification of Diseases 9th Revision Clinical Modification, 2nd Edition. (1980). (DHHS Publication No. (PHS) 80-1260). U.S. Department of Health and Human Services, Public Health Service, Health Care Financing Administration.

Jones, P., & Bolton, L. B. (no date). Determinants of nursing care. Labor and Delivery. An obstetrical acuity scoring system for labor and delivery. Los Angeles, CA: Cedars-Sinai Medical Center.

Killeen, M. B. (no date). Killeen maternity patient classification system. Assorted documents.

Lensing, S. B. (1987). A history of the development of the Navy Medical Department's Workload Management System for Nursing. Bethesda, MD: Naval School of Health Sciences Research Department.

Lewis, E. N. (1988). Manual of patient classification. Systems and techniques for practical application. Rockville, MD: Aspen Publishers, Inc.

Lewis, E. N., & Carini, P. V. (1984). Nursing Staffing and Patient Classification. Rockville, MD: Aspen Publishers, Inc.

Medicus Systems Corporation (Medicus). (1987). LADPAQ™. Labor and delivery productivity and quality. Evanston, IL.

Misener, T. R., Frelin, A. J. & Twist, P. A. (1987). Sampling Nursing Time Pinpoints Staffing Needs. Nursing & Health Care, 8(4), 233-237.

Misener, T. R., Frelin, A. J., & Twist, P. A. (1983). Time spent in indirect nursing care (Report 83-004). Fort Sam Houston, TX: U. S. Army Health Care Studies and Clinical Investigation Activity.

NAACOG. (1988). NAACOG OGN nursing practice resource. Considerations for professional nurse staffing in perinatal units. Prepared by the committee on practice of NAACOG, the organization for obstetric, gynecologic, and neonatal nurses. Washington, D.C.

Reider, K. A., & Jackson, S. S. (1985). An evaluative study of the Navy Medical Department's patient classification and staffing allocation system. The Workload Management System for Nursing. (Report 5-85). Bethesda, MD: Naval School of Health Sciences Research Department.

Reider, K. A., & Lensing, S. B. (1987). Nursing productivity: Evolution of a systems model. Nursing Management, 18(8), 33-44.

Rew, L., Stuppy, D., & Becker, H. (1988). Construct validity in instrument development: A vital link between nursing practice, research, theory. Advances in Nursing Science, 10(4), 10-22.

Schmid, M., & Gerlach, C. (1986). LDRP: Staffing a single care maternity system. Nursing Management, 17(8), 36-40.

Sherrod, S. M. (1984). Patient Classification System: A link between diagnosis-related groupings and acuity factors. Military Medicine, 149 506-511.

Sherrod, S. M., Rauch, T. M., & Twist, P. A. (1981). Nursing care hours standards - Parts I through VIII (Report 81-009). Fort Sam Houston, TX: Health Care Studies Division.

Thompson, J. D., & Diers, D. (1988). Management of nursing intensity. Nursing Clinics of North America, 23, 473-492.

U.S. Army Manpower Requirements and Documentation Agency (USAMARDA). (1986). Manpower Staffing Standards. Final Report. Washington, DC.

Vail J. D., Morton, D. A., & Rieder, K. A. (1987). Workload management system highlights staffing needs. Nursing & Health Care. 8(5), 289-293.

APPENDIX A

Inventory of Direct Care Tasks in the L&D Domain
(Work Center Description)

I. Likely Occurring Direct Care Activities

A. Vital signs

1. Take and record vital signs with monitored uterine contractions and fetal assessment

2. Take and record vital signs with monitored uterine contractions, fetal assessment, and neurological assessment

3. Take and record vital signs with manual uterine contractions and fetal assessment

4. Take and record vital signs with manual uterine contractions, fetal assessment and neurological assessment

5. Take and record pulse, respiration, blood pressure and/or temperature

B. Monitoring

1. Admits or transfers inpatient

2. Completes pregnancy assessment in exam room

3. Measures and records intake

4. Completes maternal/fetal assessment, electronically monitored

5. Completes maternal/fetal assessment, manually monitored

6. Measures and records output--urine

7. Performs recovery room assessment

   a.) Initial assessment--general, spinal, epidural anesthesia

   b.) Initial assessment--local or no anesthesia

   c.) Follow-up assessment

   d.) Discharges patient from recovery room

Appendix A: Inventory of Direct Care Tasks in the L&D Domain--continued

8. Coaches/assesses second stage labor (if not in delivery room)

9. Applies ultrasonic/tocotransducer

10. Adjusts ultrasonic/tocotransducer

11. Performs/assists with vaginal exam

C. Activities of daily living/feeding

1. Assists patient with ambulation

2. Provides assisted care

3. Provides complete care

4. Changes bed linen (either occupied or unoccupied bed)

5. Changes bed linen protector/chux

6. Changes patient's position in bed

7. Gives bedpan

8. Serves meal tray, preparation required

9. Serves meal tray, no preparation required

D. IV therapy

1. Administers blood products

2. Changes IV bottle and adjusts flow rate

3. Discontinues IV infusion (other than in L&D recovery room)

4. Sets up infusion pump

5. Provides IV catheter care

6. Performs IV medication titration

7. Starts IV

Appendix A: Inventory of Direct Care Tasks in the L&D Domain--continued

E. Treatments/procedures/medications

1. Assists with amniocentesis
2. Assists with amnioinfusion
3. Assists with amniotomy
4. Assists with delivery
    a.) Vaginal delivery without complications
    b.) Vaginal delivery with complications
    c.) C-section, scrub and circulate
    d.) C-section, scrub only
    e.) C-section, circulate only
5. Reinforces dressing
6. Obtains rhythm strip or 12-lead EKG
7. Assists with or inserts electrode, fetal scalp
8. Assists with intrauterine pressure catheter electrode insertion
9. Assists with concurrent insertion of fetal scalp and intrauterine pressure catheter electrodes
10. Assists with initial epidural anesthesia set-up
11. Assists with external fetal version
12. Provides care for fetal demise
13. Assists with fetal scalp sampling
14. Administers IV medication
15. Administers medication other than IV
16. Conducts nipple stimulation contraction test
17. Conducts nonstress test
18. Completes surgical prep

Appendix A: Inventory of Direct Care Tasks in the L&D Domain--continued

19. Assists with/performs ultrasound

20. Performs urinary catheterization, indwelling or straight

21. Collects urine specimen--clean catch or sterile

22. Performs venipuncture--blood culture encounter

23. Performs venipuncture--blood sample encounter

F. Respiratory therapy

1. Conducts incentive spirometer treatment

2. Administers oxygen--initial and adjustment

G. Teaching and emotional support

1. Teaches breast care

2. Teaches breast feeding

3. Teaches perineal suture care

4. Provides support during contractions, other than second stage labor

Appendix A: Inventory of Direct Care Tasks in the L&D Domain--continued

II. Possibly Occurring Direct Care Activities

A. **Vital signs:** no additional activities

B. **Monitoring**

1. Measures ambulatory weight
2. Measures abdominal girth
3. Measures and monitors central venous pressure
4. Assesses heart sounds
5. Measures and assesses pulmonary artery pressure
6. Measures and assesses pulmonary wedge pressure
7. Monitors cardiac rate and rhythm
8. Measures cardiac output
9. Assesses pulmonary status

C. **Activities of daily living/feeding**

1. Provides oral hygiene
2. Provides AM care
3. Provides PM care
4. Provides nail care
5. Shampoos hair
6. Assists in AM care, supplies provided
7. Assists with bath, supplies provided
8. Assists with seated shower
9. Assists with tub bath
10. Changes bottom sheet, occupied bed
11. Changes top sheet, occupied bed
12. Feeds patient

Appendix A: Inventory of Direct Care Tasks in the L&D Domain--continued

13. Provides fluid

14. Gives snack

15. Administers total parenteral nutrition

16. Administers tube feeding

17. Measures output--liquid feces

18. Measures output--drainage bottle

19. Weights output--bed linen

20. Changes position of bed

21. Transfers patient from bed to stretcher

22. Adjusts side rails

23. Assists with exercise, active range of motion

24. Assists with exercise, passive range of motion

25. Visits with patient, purposeful interaction unrelated to other direct care tasks

D. IV therapy: No additional activities

E. Administers treatments/procedures/medications

1. Inserts nasogastric tube

2. Irrigates nasogastric tube

3. Removes nasogastric tube

4. Administers enema

5. Administers retention enema

6. Performs lavage

7. Performs nasogastric tube instillation

8. Inserts rectal tube

9. Removes rectal tube

Appendix A: Inventory of Direct Care Tasks in the L&D Domain--continued

10. Adjusts cardiac monitor, connects leads, resets alarm
11. Performs wound care
12. Performs tasks related to EENT
13. Performs skeletal care
14. Assists with diagnostic testing at bedside
15. Performs psychiatric observation
16. Performs gastrointestinal assessment
17. Provides maternal postmortem care
18. Performs CPR

F. Respiratory therapy

1. Maintains/monitors endotracheal/tracheostomy tube cuff pressure
2. Changes tracheostomy cannula/dressing
3. Cleans tracheostomy cannula
4. Performs suctioning--oral, nasotracheal, endotracheal, tracheostomy
5. Administers/assists with IPPB treatment
6. Performs respiratory resuscitation
7. Encourages coughing and deep breathing
8. Positions patient for x-ray
9. Performs suctioning, bulb syringe
10. Assists with intubation
11. Assists with extubation

G. Teaching and emotional support: No additional activities

APPENDIX B

List of Sherrod Tasks Considered--L&D Specific and General

NOTE: Extracted from Sherrod, Rauch, & Twist, 1981, HCSD Report #81-009 Part I - Section A

L&D SPECIFIC DIRECT NURSING TASKS

Task Number	Direct Nursing Task
2401	Vulvar/anal area prep
2402	Support during contraction
2403	Dilatation and effacement assessment
2404	Dilatation and effacement assessment, assisting physician
2405	Fetal electrode insertion
2406	Fetal electrode insertion, assisting physician
2407	Intrauterine catheter insertion
2408	Intrauterine catheter insertion, assisting physician
2409	Internal or external monitoring--uterine contraction/fetal heart tones
2410	Manual contraction assessment
2411	Pitocin induction, assisting physician
2412	Fetal heart tones, manual
2413	Fetal heart tones, doppler
2414	Fetal scalp sampling, assisting physician
2415	Routine delivery room functions
2416	Fundus massage
2417	Changing perineal pad
2418	Perineal suture care
2419	Teaching--perineal suture care

Appendix B: List of Sherrod Tasks Considered--L&D Specific and General--continued

Task Number	Direct Nursing Task
2420	Teaching--breast care
2421	Oxytocin challenge test
2422	Nonstress test
2423	Amniotomy
2424	Amniocentesis
2425	Newborn identification procedure
2426	Teaching--breast feeding
2427	Pitocin induction
2428	Tocotransducer--application
2429	Ultrasonic transducer--application
2430	Fetal electrode insertion/intrauterine catheter insertion
2431	Fetal electrode insertion/intrauterine catheter insertion, assisting physician
2432	Tocotransducer and ultrasonic transducer--application
2433	Observation and assessment, second stage of labor
2434	Labor room examination and preparation, routine
2435	Adjust ultrasonic transducer/tocotransducer
2436	Monitoring fetal heart tones, ultrasonic transducer
2437	Monitoring fetal heart tones, ultrasonic transducer and uterine contraction, tocotransducer

Appendix B: List of Sherrod Tasks Considered--L&D Specific and General--continued

GENERAL DIRECT NURSING TASKS RELEVANT TO L&D

Task Number	Direct Nursing Task
HYGIENE	
0101	Bathing, complete
0102	Bathing, assist with back and legs
0103	Oral hygiene
0109	Occupied bed
0110	Unoccupied bed
0111	Changing bottom sheet
0118	Changing bed linen protector/chux
NUTRITION	
0202	Fluid
0204	Serving meal tray, preparation required
0208	Measuring and recording intake
0211	Serving meal tray, no preparation required
ELIMINATION	
0301	Measuring and recording output--urine
0303	Measuring and recording output--vomitus
0305	Giving a bedpan
MOBILITY	
0401	Mobility--ambulating first time

Appendix B: List of Sherrod Tasks Considered--L&D Specific and General--continued

Task Number	Direct Nursing Task
	CHANGING POSITION
0501	Changing patient's position in bed
	PSYCHOLOGICAL
0701	Orientation to clinical unit
0702	Explanation of procedures and tests
0703	Answering patient's question
	PHYSIOLOGICAL PARAMETERS
0801	Blood pressure, manual
0808	Oral temperature, pulse and respirations
1003	12-lead EKG
1010	Rhythm strip-EKG machine
1104	Neurological orientation
1105	Motor/sensory testing
1402	Oxygen administration--mask
1403	Oxygen administration--prongs
1420	Incentive spirometer
1501	Venipuncture--blood sample
1502	Venipuncture--blood culture
1504	Intravenous infusion--flow rate
1505	Intravenous infusion--initiating
1506	Intravenous infusion--change IV bottle
1507	Intravenous infusion--IV push medication
1508	Intravenous infusion--IV catheter care

Appendix B: List of Sherrod Tasks Considered--L&D Specific and General--continued

Task Number	Direct Nursing Task
	PHYSIOLOGICAL PARAMETERS--continued
1509	Intravenous infusion--piggyback medication
1510	Intravenous or arterial line--termination
1511	Intravenous infusion--infusion pump set-up
1514	Intravenous infusion--blood
1520	Intravenous infusion--platelets/plasma
1606	Reinforcing dressing
1613	Surgical prep, local
1621	Death care
1901	Catheterization--foley
1902	Catheterization--straight
1905	Urine specimen--clean catch/foley
2101	Medication, oral
2102	Medication, intramuscular
2103	Medication, subcutaneous
2104	Medication, suppository, rectal/vaginal
2105	Medication, topical

APPENDIX C

L&D Specific Direct Nursing Tasks Reviewed by L&D Clinical Experts

NOTE: An asterisk (*) identifies those tasks eliminated per recommendation of clinical experts; see text and Appendix D for rationale underlying the recommendations.

SHERROD ET AL. DIRECT NURSING TASKS

NOTE: Extracted from Sherrod, Rauch, & Twist, 1981, HCSD Report #81-009 Part I--Section A

Task Number	Direct Nursing Task
*2401	Vulvar/anal area prep
2402	Support during contraction
2403	Dilatation and effacement assessment
2404	Dilatation and effacement assessment, assisting physician
*2405	Fetal electrode insertion
2406	Fetal electrode insertion, assisting physician
*2407	Intrauterine catheter insertion
2408	Intrauterine catheter insertion, assisting physician
2409	Internal or external monitoring--uterine contraction/fetal heart tones
2410	Manual contraction assessment
*2411	Pitocin induction, assisting physician
2412	Fetal heart tones, manual
2413	Fetal heart tones, doppler
2414	Fetal scalp sampling, assisting physician
2415	Routine delivery room functions
*2416	Fundus massage
*2417	Changing perineal pad

Appendix C: L&D Specific Direct Nursing Tasks Reviewed by L&D Clinical Experts--continued

Task Number	Direct Nursing Task
2418	Perineal suture care
2419	Teaching--perineal suture care
2420	Teaching--breast care
2421	Oxytocin challenge test
2422	Nonstress test
2423	Amniotomy
2424	Amniocentesis
*2425	Newborn identification procedure
2426	Teaching--breast feeding
*2427	Pitocin induction
*2428	Tocotransducer--application
*2429	Ultrasonic transducer--application
*2430	Fetal electrode insertion/intrauterine catheter insertion
2431	Fetal electrode insertion/intrauterine catheter insertion, assisting physician
2432	Tocotransducer and ultrasonic transducer--application
2433	Observation and assessment, second stage of labor
2434	Labor room examination and preparation, routine
2435	Adjust ultrasonic transducer/tocotransducer
*2436	Monitoring fetal heart tones, ultrasonic transducer
*2437	Monitoring fetal heart tones, ultrasonic transducer and uterine contraction, tocotransducer

Appendix C: L&D Specific Direct Nursing Tasks Reviewed by L&D Clinical Experts--continued

ADDITIONAL L&D DIRECT NURSING TASKS

NOTE: Derived from Warren and Bussey, 1987, Navy Report 4-87, as well as through discussion with individual L&D nurses

Task Number	Direct Nursing Task
2800	Recovery room assessment
*2801	Contraction stress test
2802	Amnioinfusion
2803	External fetal version
2804	Ultrasound
*2805	Anesthesia administration, assisting physician
2806	Teaching -- fetal movement count
2807	Cesarean section, assist
2808	Comfort measures
2809	General anesthesia, recovery of postpartum patient
2810	Intravenous titration of medication
2811	Local anesthesia, recovery of postpartum patient
*2812	Newborn care
2813	Nipple stimulation contraction test
2814	Exam room, nonlabor
2815	Isolation
2816	Epidural anesthesia, assisting physician
*2817	Fetal distress
*2818	Preeclamptic/eclamptic

Appendix C: L&D Specific Direct Nursing Tasks Reviewed by L&D Clinical Experts--continued

ADDITIONS SUGGESTED BY CLINICAL EXPERTS DURING TELEPHONE CONFERENCE

Leopold's maneuvers

Telephone consultation

APPENDIX D

Summary of the Critique of Clinical Experts

Outmoded tasks

Task Number	Direct Nursing Task
2401	Vulvar/anal area prep
2428	Tocotransducer -- application would be done concurrently with ultrasonic transducer and is therefore captured in 2432: Tocotransducer and ultrasonic transducer, application
2429	Ultrasonic transducer -- application would be done concurrently with tocotransducer and is therefore captured in 2432: Tocotransducer and ultrasonic transducer, application

Beyond the scope of routine nursing practice

Task Number	Direct Nursing Task
2405	Fetal electrode insertion -- this task can be done by registered nurses ONLY if they are credentialed to perform it
2407	Intrauterine catheter insertion -- this task can be done by registered nurses ONLY if they are credentialed to perform it
2430	Fetal electrode insertion/intrauterine catheter insertion -- this task can be done by registered nurses ONLY if they are credentialed to perform it

Appendix D: Summary of the Critique of Clinical Experts--continued

Tasks combined with or embedded in other tasks

Task Number	Direct Nursing Task

- Part of medication titration (2810):

  2411 Pitocin induction, assisting physician

  2427 Pitocin induction

  It was decided that the nursing activities involved in the induction and titration of special labor and delivery medications (i.e., pitocin, ritodrine, magnesium sulfate) were essentially the same. Generally speaking, these activities concern doing a comprehensive maternal and fetal assessment. Therefore, the task was captured as medication titration with annotation on the data collection forms to verify the type medication used thus allowing analysis of whether there were meaningful differences among types of medications as well as between the starting the medication and adjusting the dosage after induction.

- Part of anesthesia recovery (2800, 2809, 2811):

  2416 Fundus massage

  2417 Changing perineal pad

- Part of delivery, (both 2415: Routine delivery room functions and 2807: Cesarean section, assist):

  2425 Newborn identification procedure

  2812 Newborn care

- Part of internal or external monitoring, uterine contraction/fetal heart tone (2409):

  2436 Monitoring fetal heart tones, ultrasonic transducer

  2437 Monitoring fetal heart tones, ultrasonic transducer and uterine contraction, tocotransducer

Appendix D: Summary of the Critique of Clinical Experts--continued

Tasks that were redundant

Task Number Direct Nursing Task

- Contraction stress test (2801) was deleted as it is a generic name for

  2421 Oxytocin challenge test

  2422 Nonstress test

  2813 Nipple stimulation contraction test

- The same procedure is referred to by both:

  2816 Epidural anesthesia administration and

  2805 Anesthesia administration. This was deleted as it is the more general term, but epidural anesthesia administration was coded as 2805

Tasks better measured by their individual elements

Isolation (2815): This task can be broken into activities that have already been measured. Furthermore, some of the related elements such as gowning and gloving are captured under indirect care.

Fetal distress (2817): This is a diagnosis rather than an activity. The tasks that would be done such as changing positions (right and left lateral, knee chest), administering oxygen, and increasing the flow rate of IV infusions have already been measured.

Preeclamptic/eclamptic (2818): This is a diagnosis rather than an activity. The tasks that might be involved can be measured separately to include administering IV magnesium sulfate.

Infrequently occurring and captured in a proxy measure

Preparing body after stillbirth: While the emotional component is long and involved, the tasks involved in this activity are similar enough to Death Care (1621) to use that as a proxy measure.

Appendix D: Summary of the Critique of Clinical Experts--continued

Infrequently occurring

Arterial line set-up and management

Central venous pressure set-up, measurement and management

Pulmonary artery catheter set-up, measurement and management

Captured in other ways

Air evacuation activities: most of these tasks will be reflected in indirect care

Hi-Risk antepartal care: while these patients warrant special attention, the tasks involved with their care have been taken into account and can be captured

Additions suggested by clinical experts during telephone conference
(also annotated in Appendix C)

Leopold's maneuvers

Telephone consultation

APPENDIX E

Operational Definitions

Revised Sherrod, Rauch & Twist Definitions

Task Number	Direct Nursing Task
2402	SUPPORT DURING CONTRACTION: Upon arrival at bedside, verbally reassure patient and significant other, provide touch support as indicated, encourage and demonstrate proper breathing and then depart patient's area.
2403	DILATATION AND EFFACEMENT ASSESSMENT: Explain procedure to patient. Set up equipment at bedside, position patient for procedure, perform vaginal examination for assessment of dilatation level, effacement and station; then remove equipment from area.
2404	DILATATION AND EFFACEMENT ASSESSMENT, ASSISTING PHYSICIAN: Explain procedure to patient. Set up equipment at bedside, position patient for procedure, assist physician with the examination; then remove equipment from area.
2406	FETAL ELECTRODE INSERTION, ASSISTING PHYSICIAN: Explain procedure to patient. Set up equipment at bedside, position patient, assist physician with procedure, secure monitor leads to patient's lower extremity, connect equipment, assess and record fetal heart rate; then remove used equipment from area.
2408	INTRAUTERINE CATHETER INSERTION, ASSISTING PHYSICIAN: Set up equipment at bedside. Position patient, assist physician with procedure, connect monitoring equipment, flush catheter with sterile water, zero and calibrate monitor; then remove used equipment from area.
2409	INTERNAL OR EXTERNAL MONITORING--UTERINE CONTRACTION/FETAL HEART TONES: Upon arrival at bedside, explain procedure to patient. Assess baseline fetal heart rate, variability (with fetal scalp electrodes), presence of periodic changes; frequency, intensity, and duration of contractions to include uterine resting tone if an intrauterine pressure catheter is in place. Evaluate the maternal tolerance of contractions. Calculate the amplitude and duration of the contractions.
2410	MANUAL CONTRACTION ASSESSMENT: Upon arrival at bedside, explain procedure to patient. Expose abdominal area, place hand over uterus and assess strength and duration of uterine contraction, remove hand after evaluation.

Appendix E: Operational Definitions--continued

Revised Sherrod, Rauch & Twist Definitions

Task Number	Direct Nursing Task
2412	FETAL HEART TONES, MANUAL: Upon arrival at bedside, explain procedure to patient, position patient, expose abdominal area, assess fetal heart tones (FHTs) with fetoscope by counting them for one minute, record FHTs; then remove equipment from area.
2413	FETAL HEART TONES, DOPPLER: Upon arrival at bedside, explain procedure to patient, position patient, expose abdominal area, assess fetal heart tones using the doptone, clean abdomen, record results; then remove equipment from area.
2414	FETAL SCALP SAMPLING, ASSISTING PHYSICIAN: Explain procedure to patient. Set up equipment at bedside, assess baseline fetal heart tones, position patient, assist physician with procedure, monitor and assess fetal heart tones, label blood samples; then remove used equipment from area.
2415	DELIVERY ROOM FUNCTIONS, VAGINAL DELIVERY: Depart labor room. Upon arrival in delivery room, assist patient onto table and position, set up delivery trays, perform perineal scrub, assess status of mother and fetus, provide assistance to physician and patient during the delivery room process. Once newborn is delivered, establish the airway, determine apgar score, label cord blood, clamp umbilical cord, stabilize neonate's temperature, and complete identification of neonate. Perform general screening of normal newborn, or assist with emergency care of newborn. Assist physician with delivery of placenta, massage fundus and determine level of fundus, administer medications to patient. Assist with breastfeeding on delivery table if patient chooses to breast feed. Provide opportunity for family attachment. Complete delivery records, reposition patient, transfer to stretcher and transport to recovery room.
2418	PERINEAL SUTURE CARE: Explain procedure to patient. Cleanse perineum. Irrigate with water, dry suture area; remove supplies from area.
2419	TEACHING - PERINEAL SUTURE CARE: Place equipment at bedside, instruct patient on technique of perineal care, i.e., cleanse perineum, irrigate with water, dry suture area, apply topical anesthetic as ordered.
2420	TEACHING - BREAST CARE: Upon arrival at bedside, instruct patient on how to cleanse area around nipple, the need for wearing a support bra, and how to recognize minor signs and symptoms of problems that may occur.

Appendix E: Operational Definitions--continued

Revised Sherrod, Rauch & Twist Definitions

Task Number	Direct Nursing Task
2421	OXYTOCIN CHALLENGE TEST: Explain procedure to patient and offer emotional support. Witness written consent. Set up equipment at bedside, prepare and position patient. Assess baseline maternal and fetal vital signs. If spontaneous contractions do not occur, set up and initiate intravenous infusion using an infusion pump, regulate flow rate on infusion pump, assess status of mother (P, BP; frequency, intensity, and duration of uterine contractions) and fetus (variability, periodic changes, frequency, and duration of contractions) during the procedure as prescribed by unit protocol.
2422	NONSTRESS TEST: Explain procedure to patient. Prepare and position patient, set-up equipment at bedside. Assess baseline maternal vital signs and fetal heart tones. Turn on monitor, recording patient's name, date, time, and reason for test. Instruct patient to depress test button when she experiences fetal movement. Continue monitoring and assessment until reactive patter is obtained or further evaluation becomes necessary. Detach patient from monitor.
2423	AMNIOTOMY, ASSISTING PHYSICIAN: Explain procedure to patient. Set-up equipment at bedside, position patient for procedure, assess fetal heart rate, assess patient's vital signs, assist physician with procedure, assess fetal status post procedure, reposition mother, provide dry area for sitting; then remove used equipment from area.
2424	AMNIOCENTESIS, ASSIST PHYSICIAN: Explain procedure to patient, witness written consent. Set up equipment at bedside, obtain baseline maternal and fetal status assessment, position patient. Assist physician with procedure, assess maternal/fetal status, label specimens; then remove equipment from area.
2426	TEACHING - BREAST FEEDING Provide instructions on the technique of breast feeding; observe mother during the feeding process to assess proper technique.
2431	FETAL ELECTRODE INSERTION/INTRAUTERINE CATHETER INSERTION, ASSISTING PHYSICIAN: Set up equipment at bedside, explain procedures to patient, position patient, assist physician with procedures, secure monitor leads to patient's lower extremity, flush intrauterine catheter with sterile water, connect monitoring equipment, assess and record both fetal status as well as uterine contractions; remove used equipment from area.

Appendix E: Operational Definitions--continued

Revised Sherrod, Rauch & Twist Definitions

Task Number	Direct Nursing Task
2432	TOCOTRANSDUCER AND ULTRASONIC TRANSDUCER--APPLICATION: Upon arrival at bedside, explain procedure to patient, position patient, expose abdominal area, apply tocotransducer and ultrasonic transducer, connect to monitoring equipment, assess status of contractions and fetal status; then depart area.
2433	OBSERVATION AND ASSESSMENT, SECOND STAGE OF LABOR: When complete dilatation of the cervix occurs, a member of the nursing staff remains in constant attendance to evaluate maternal and fetal status, and to encourage proper breathing, positioning, and bearing down efforts. Teaching and support are provided as necessary. Includes detaching monitors and preparing patient for transport to the delivery room.

New Definitions--derived from Navy report (Bussey & Warren) and expert panel

Task Number	Direct Nursing Task
2800	EPIDURAL ANESTHESIA, RECOVERY OF PATIENT: Upon arrival at bedside complete the following: (a) Uterus assessment by inspection and palpation, examine for involution, tone, contour and location; (b) Bladder assessment by eliciting feedback, inspection and palpation, assessing for distention, frequency of urination and pain on urination; (c) Episiotomy assessment by assisting patient into a lateral position and by inspection of perineal/rectal area, assess for bleeding; (d) Lochia assessment by noting amount and character of flow; (e) Vital signs; (f) DTR's if continuing with $MgSO_4$; (g) Neuro checks; depart from bedside.
2802	AMNIOINFUSION: Explain procedure to patient. Set up equipment at bedside, assess baseline fetal heart tones, position patient, assist physician with procedure, monitor and assess fetal heart tones, remove equipment from area.
2803	EXTERNAL FETAL VERSION: Explain procedure to patient. Place equipment at the bedside, assess baseline vital signs, attach fetal monitor and assess fetal heart rate and patterns. Administer medication as ordered. Loosen or remove monitor straps. Assist with procedure. Reapply monitor and assess uterine activity and fetal heart pattern. Remove equipment from bedside.

Appendix E: Operational Definitions--continued

New Definitions--derived from Navy report (Bussey & Warren) and expert panel

Task Number	Direct Nursing Task
2804	ULTRASOUND: Explain procedure to patient. Place equipment at bedside, assist physician with procedure, remove equipment from bedside.
2805	EPIDURAL ANESTHESIA ADMINISTRATION, ASSISTING PHYSICIAN: Explain procedure to patient. Place equipment at bedside, assess baseline vital signs as well as maternal and fetal status, assist physician with procedure, assess and monitor vital signs, fetal heart tones and uterine activity, remove equipment from area, continue monitoring vital signs, fetal heart tones and uterine activity, initiate neuro checks if warranted.
2806	TEACHING - FETAL MOVEMENT COUNT: Upon arrival at bedside, provide instruction on purpose and method of counting fetal movement, explain documentation of fetal movement count.
2807	CESAREAN SECTION, ASSIST: Assist patient to table and reposition, assist physician, circulate, set-up instrument tray; drape patient, assist with newborn care; provide opportunity for family attachment and assist significant other as needed, label pathology specimen, transfer to stretcher and transport to recovery room.
2808	COMFORT MEASURES: Wash patient's face and hands, assist with oral hygiene, offer ice chips, provide back rubs as needed, assist with position changes; assist to the bathroom or offer the bedpan; give partial bed bath or assist to the sink for a partial bath, with change of hospital gown.
2809	GENERAL ANESTHESIA, RECOVERY OF PATIENT: Upon arrival at bedside complete the following: (a) Uterus assessment by inspection and palpation, examine for involution, tone, contour and location; (b) Bladder assessment by eliciting feedback, inspection and palpation, assessing for distention, frequency of urination and pain on urination; (c) Episiotomy assessment by assisting patient into a lateral position and by inspection of perineal/rectal area, assess for bleeding; (d) Lochia assessment by noting amount and character of flow; (e) Vital signs; (f) DTR's if continuing with $MgSO_4$; (g) Assist patient in coughing/deep breathing; depart from bedside.
2810	INTRAVENOUS TITRATION OF MEDICATION: Check infusion pump operation and IV flow rate, make flow rate adjustments, monitor patient and fetal response.

Appendix E: Operational Definitions--continued

New Definitions--derived from Navy report (Bussey & Warren) and expert panel

Task Number	Direct Nursing Task
2811	LOCAL ANESTHESIA, RECOVERY OF PATIENT: Upon arrival at bedside complete the following: (a) Uterus assessment by inspection and palpation, examine for involution, tone, contour and location; (b) Bladder assessment by eliciting feedback, inspection and palpation, assessing for distention, frequency of urination and pain on urination; (c) Episiotomy assessment by assisting patient into a lateral position and by inspection of perineal/rectal area, assess for bleeding; (d) Lochia assessment by noting amount and character of flow; (e) Vital signs; (f) DTR's if continuing with $MgSO_4$; depart from bedside.
2813	NIPPLE STIMULATION CONTRACTION TEST: Set patient up as for a non-stress test. Explain procedure to patient; teach and monitor nipple stimulation technique per unit protocol. Obtain baseline fetal and maternal assessment. Begin the test with monitoring according to unit protocol. When test is completed, detach patient from monitor.
2814	EXAM ROOM, NONLABOR: Obtain nursing history from the patient and complete initial assessment; review outpatient chart; obtain baseline maternal and fetal assessment; weigh patient; obtain a urine specimen for protein and glucose; notify provider (physician or midwife) of patient's presence; continue to monitor as needed.
2815	TELEPHONE CONSULTATION: Conversation commences between RN and patient. Discussion ensues to assess maternal/paternal/fetal well-being. Typical questions include if the baby is moving; whether fluid is leaking; and how often contractions are occurring. Consultation terminates when conversation with RN concludes.
2816	RECOVERY OF PATIENT WITH NO ANESTHESIA: Upon arrival at bedside complete the following: (a) Uterus assessment by inspection and palpation, examine for involution, tone, contour and location; (b) Bladder assessment by eliciting feedback, inspection and palpation, assessing for distention, frequency of urination and pain on urination; (c) Episiotomy assessment by assisting patient into a lateral position and by inspection of perineal/rectal area, assess for bleeding; (d) Lochia assessment by noting amount and character of flow; (e) Vital signs; (f) DTR's if continuing with $MgSO_4$; depart from bedside.

Appendix E: Operational Definitions--continued

New Definitions--derived from Navy report (Bussey & Warren) and expert panel

Task Number	Direct Nursing Task
2817	RECOVERY OF PATIENT, SPINAL ANESTHESIA: Upon arrival at bedside complete the following: (a) Uterus assessment by inspection and palpation, examine for involution, tone, contour and location; (b) Bladder assessment by eliciting feedback, inspection and palpation, assessing for distention, frequency of urination and pain on urination; (c) Episiotomy assessment by assisting patient into a lateral position and by inspection of perineal/rectal area, assess for bleeding; (d) Lochia assessment by noting amount and character of flow; (e) Vital signs; (f) DTR's if continuing with $MgSO_4$; (g) Neuro checks; (h) Sensory/motor checks; depart from bedside.
2820	RECOVERY ROOM, ADMISSION: (This definition corresponds to 2703 in the post anesthesia care unit study). This is the first encounter with the patient upon their arrival to the recovery area; depending on anesthesia type, only select activities may be performed. Upon arrival at the patient's bedside: (a) insure airway patency and initiate O_2, (b) place IV fluids/blood products on IV pole and check flow rate and amount of fluid in the bag(s), (c) assess integrity of IV site(s), (d) connect patient to pulse oximeter, (e) place cardiac monitor electrodes and note initial cardiac monitoring for rate and rhythm, (f) inspect dressings and drains, (g) assess and record vital signs, (h) receive report from anesthetist/anesthesiologist, (i) report baseline measurements to anesthetist/anesthesiologist, (j) assess patient's total condition, (k) assess patient's body position and reposition if necessary, (l) initiate stir up routine--encourage patient to cough and deep breathe, orient her to the unit, (m) record initial nursing assessment, depart from the patient's bedside.
2821	RECOVERY ROOM, DISCHARGE: (This definition corresponds to 2708 in the post anesthesia care unit study). This is the final encounter with the patient prior to discharge from the recovery area to the postpartum unit. Depending on the anesthesia type, select activities may not be appropriate. Upon arrival at the patient's bedside: (a) complete final assessment of patient, (b) disconnect from monitor(s), (c) empty urine collection bag, (d) mark output from other drainage containers, (e) hang new IV bag, (f) record intake and output, (g) review plans with patient and answer questions, (h) transfer patient to wheelchair, (i) depart the recovery area.

APPENDIX F

Statistical Parameters for Sherrod Data

NOTE: Original data--sample size, mean, standard deviation, and range--were extracted from Sherrod, Twist, & Rauch, 1981, Part I--Section A, Appendix D, pages D-11 and D-12. Standard error and desired sample size for accuracy/ precision as prescribed by regulation (n') were calculated from these data. Standard error is a common calculation; n' was derived from the formulas in Air Force Regulation 25-5 dated 16 May 1988, Table 15-1, page 251. An asterisk (*) in the n' column signifies that the sample size used in this study met or exceeded the regulatory requirements for accuracy/precision).

						Range	
TASK	N	M	SD	SE	n'	Minimum	Maximum
2402	96	2.168	6.721	.686	3795	.27	65.88
2403	113	1.777	1.900	.179	450	.40	20.07
2404	198	2.014	1.433	.102	*	.37	12.72
2406	24	3.582	1.490	.304	74	1.12	7.92
2408	6	9.213	4.363	1.781	148	4.28	14.87
2409	114	1.086	1.498	.140	747	.08	13.62
2410	65	1.891	1.767	.219	349	.15	6.55
2412	124	1.423	1.003	.090	194	.28	5.77
2413	67	2.182	1.784	.218	267	.57	11.15
2414	This task was identified but not measured by Sherrod et al.						
2415	136	56.794	27.827	2.386	*	.83	180.00
2418	10	2.853	1.395	.441	122	1.03	5.10
2419	24	2.438	.957	.195	64	.65	4.65
2420	4	2.803	1.671	.835	360	1.15	5.08
2421	6	61.403	33.557	13.699	197	28.00	125.00
2422	30	24.319	20.919	3.819	309	3.83	97.63
2423	28	3.403	1.457	.275	77	1.33	7.28

Appendix F: Statistical Parameters for Sherrod Data--continued

TASK	N	M	SD	SE	n'	Range Minimum	Range Maximum
2424	5	29.184	15.799	7.066	226	13.85	55.62
2426	16	12.698	9.763	2.441	266	1.17	32.90
2431	28	8.074	4.703	.889	143	.97	23.75
2432	37	5.256	2.535	.417	96	1.50	12.38
2433	44	52.442	49.960	7.5319	369	3.43	227.08
2434	64	26.029	13.925	1.705	114	7.27	77.00
2435	38	2.928	5.707	.929	1558	.35	31.68

APPENDIX G

Tasks Timed By HCSCIA

From the Sherrod, Rauch & Twist Study	New Tasks
2406--Fetal Electrode Insertion, Assisting Physician	2800--Epidural Anesthesia, Recovery of Patient
2408--Intrauterine Catheter Insertion, Assisting Physician	2802--Amnioinfusion
2414--Fetal Scalp Sampling, Assisting Physician	2803--External Fetal Version
2415--Delivery Room Functions, Vaginal Delivery	2804--Ultrasound
2418--Perineal Suture Care	2805--Epidural Anesthesia Administration, Assisting Physician
2419--Teaching, Perineal Suture Care	2806--Teaching, Fetal Movement Count
2420--Teaching, Breast Care	2807--Cesarean Section, Assist
2421--Oxytocin Challenge Test	2808--Comfort Measures
2424--Amniocentesis, Assist Physician	2809--General Anesthesia, Recovery of Patient
2426--Teaching, Breast Feeding	2810--Intravenous Titration of Medication
2431--Fetal Electrode Insertion/ Intrauterine Catheter Insertion, Assisting Physician	2811--Local Anesthesia, Recovery of Patient
2433--Observation and Assessment, Second Stage of Labor	2813--Nipple Stimulation Contraction Test
	2814--Exam Room, Nonlabor
	2815--Telephone Consultation
	2816--No Anesthesia, Recovery of Patient

Appendix G: Tasks Timed By HCSCIA--continued

New Tasks

2817--Spinal Anesthesia, Recovery of Patient

2820--Recovery Room, Admission

2821--Recovery Room, Discharge

APPENDIX H

Conceptual and Empirical Analysis of L&D Tasks

MISCODED

1. 2406 rather than 2505: Procedure 2406 was inadvertently labeled as 2405 which, per Sherrod, Rauch & Twist, 1981, does not mean assisting the physician. However, because fetal electrode insertion is beyond the scope of usual L&D nursing practice, it was assisting the physician that was measured. Therefore the correct task number is 2406.

2. 2431 rather than 2822: Procedure 2431 encompassed assisting the physician with insertion of both a fetal scalp electrode and an intrauterine pressure catheter. For a time, we renumbered the task as 2822.

COMBINED

1. Recovery room tasks:

2800	Epidural anesthesia, recovery
2809	General anesthesia, recovery
2817	Spinal anesthesia, recovery
2811	Local anesthesia, recovery
2816	No anesthesia, recovery
2820	Recovery room, admission
2821	Recovery room, discharge

The various types of anesthesia were used to compare differences in admission time, follow-up exams while in recovery, and discharge time. Comments were recorded on the data collection sheets to identify if the timing related to the initial assessment, follow-up or discharge.

There were statistically meaningful ($p<.001$) time differences depending upon whether the evaluation reflected admission, follow-up, or discharge. There were statistically discernible differences among anesthesia types only for admission, however. General, spinal and epidural anesthesia took similar amounts of time while local and no anesthesia were similar. Consequently, the seven possible recovery room assessment tasks were reduced to four combinations as follows:

a. Recovery room assessment, initial--general, spinal, or epidural anesthesia
b. Recovery room assessment, initial--local or no anesthesia
c. Recovery room assessment, follow-up
d. Recovery room, discharge or transfer out

COMBINED--continued

2. 2810 IV medication titration: This task was evaluated in three regards: (a) differences among titrating various medications,(b) differences between initiating and titrating medications, and (c) collapsing the tasks relevant to Oxytocin Challenge Test under IV medication titration.

Differences among titrating various medications: Medication titration was evaluated by type of medication involved (i.e., pitocin, ritodrine, magnesium sulfate). There were no evident statistical differences among the various medications. Furthermore, in observing clinical practice, it was evident that the maternal/fetal assessment that is the crux of the medication titration task was the same regardless of medication.

Differences between initiating and titrating medications: In consideration of keeping the worksheet as simple as possible, the differences between initiating and titrating IV medications was also evaluated. While there were statistically significant differences between initiating and titrating medications, these differences were not clinically meaningful. There was a difference of less than two minutes between the two tasks. Because the medication is initiated only once but adjusted or titrated often, the decision was to use only one task, titration, for simplicity.

Oxytocin Challenge Test (OCT): Initially, the intent was to measure OCTs as an independent task. However, in the clinical setting, it quickly became apparent that the nursing activities relevant to OCTs were best captured individually. The essence of the test concerned maternal/fetal assessment as medication was titrated. Additional explanation concerning this procedure follows. Based upon the relationship between OCTs and IV medication titration, it was believed that the procedure was best reflected as IV medication titration.

Therefore, the clinical and statistical commonalties among the three aforementioned aspects of IV medication titration justified consolidating all IV medication titration under one task.

DIVIDED

1. Deliveries

2415 Vaginal deliveries: A number of variations in vaginal deliveries were considered by examining the influence of possible confounding variables. These included moderate complications (multiple gestation, twin pregnancy; breech presentation without mention of version; secondary uterine inertia; other and unspecified uterine inertia), severe complications (third-stage hemorrhage, postpartum; other immediate postpartum hemorrhage; third-degree perineal laceration; fourth-degree perineal laceration), fetal distress, gravida, and parity.

The only variables that demonstrated statistically significant differences were gravida (multigravida patients took less time to delivery than primigravida patients) and complications (uncomplicated deliveries were less time consuming than either moderately or severely complicated deliveries; there was no appreciable difference in moderate or severely complicated deliveries). Therefore, gravida data became an important variable to consider and vaginal deliveries were divided into:

a. Vaginal, uncomplicated
b. Vaginal, complicated

2807 Cesarean section: Cesarean sections were compared with both types of vaginal deliveries, uncomplicated and complicated. In both instances, there was a statistically meaningful difference between the time involved in vaginal deliveries and the time involved in Cesarean deliveries. Therefore, Cesarean section was separated from vaginal delivery. Gravida also demonstrated a confounding influence on Cesarean delivery, but the effect was opposite that found with vaginal deliveries. The time for Cesarean section was longer for multigravida women and shorter for primigravida women. It was further evident that there were variations in provider involvement with Cesarean deliveries. To account for these, Cesarean sections were divided into:

a. Cesarean section, scrub and circulate
b. Cesarean section, scrub only
c. Cesarean section, circulate only

2. 2433 Second stage labor: Gravida also exerted an important influence on second stage labor. On the average, primigravida women were in second stage labor over twice as long as multigravida women. The statistically discernible difference in these times makes considerable clinical sense. Consequently, the use of gravida as an additional variable enabled dealing with the differences in second stage labor. While the task was not divided on the worksheet, different times were allotted to it based on the gravida of the mother.

DELETED

1. 2421 Oxytocin Challenge Test (OCT): This task has already been mentioned under combined tasks, 2810, IV medication titration. In the clinical setting, it quickly became apparent that the variation in this procedure would be too great to be clinically meaningful. For example, some OCTs could take as little as 10 minutes while others could take several hours. The mean time for the tasks would therefore be of questionable use. It was also apparent that the tasks involved with an OCT could be captured elsewhere. The procedure essentially entails a careful evaluation of the maternal/fetal response to varying doses of medication. Therefore, it was possible to eliminate OCTs as the essence of the procedure is titration and assessment.

2. 2806 Teaching fetal movement count: On the average, this task took from further consideration. An excessive number of occurrences would be needed to equal a full time equivalent thus negating the predictive value of this task.

3. 2808 Comfort measures: The mean time for this task was 2.568 minutes. However, the frequency of this task was low. Most comfort measures were provided by the significant other who was accompanying the patient through labor. Consequently, the task was eliminated from further consideration.

4. 2814 Exam room, nonlabor: There were modest differences between this task and 2434, exam room, labor. However, in consideration of the explanations that would have to be provided to the users to help them differentiate these two tasks, it was decided that the tasks were more similar than different. Thus the exam room, nonlabor task was dropped. The task, reflecting both labor and nonlabor assessments, was renamed Evaluation, exam room

5. 2815 Telephone consult: The mean time for this task was 2.532. Staff perceive that this task takes longer than the empirical evidence indicates; they also perceive that it occurs more frequently than it was observed to occur during data collection. Because of both the short duration and lower frequency of occurrence, the task was eliminated.

APPENDIX I

Statistical Parameters for Tasks Timed by HCSCIA

NOTE: Sample size, mean, standard deviation, and range were extracted from either the Sherrod, Twist, & Rauch, 1981 study or computer printouts for the current study. As with Appendix F, standard error and desired sample size for accuracy/precision as prescribed by regulation (n') were calculated for both of these data sources. Standard error is a common calculation; n' was derived from the formulas in Air Force Regulation 25-5 dated 16 May 1988, Table 15-1, page 251. An asterisk (*) in the n' column signifies that the sample size used in this study met or exceeded the regulatory requirements for accuracy/precision.

TASKS FROM THE SHERROD et al. STUDY

						Range	
TASK	N	M	SD	SE	n'	Minimum	Maximum
2406	29	4.463	2.559	.475	138	1.47	13.05
2408	27	10.486	5.743	1.105	127	2.92	25.88
2414	15	10.561	4.201	1.085	73	5.07	20.40
2415	584	68.841	28.608	1.184		3.00	235.00
2418	20	3.427	2.798	.626	292	.27	9.47
2419	47	2.329	1.313	.191	129	.77	6.87
2420	1	3.617	Calculations are meaningless with one measure				
2424	7	13.621	2.298	.869	17	11.17	18.47
2426	14	11.260	8.436	2.255	258	1.68	31.90
2431	45	13.885	5.639	.841	143	5.97	29.17
2433	326	42.773	40.930	2.267		1.00	280.00

Appendix I: Statistical Parameters for Tasks Timed by HCSCIA--continued

NEW TASKS

TASK	N	M	SD	SE	n'	Range Minimum	Range Maximum
2800	5	3.917	3.097	1.385	482	2.03	9.42
2802	3	27.861	17.679	10.207	746	13.48	47.60
2803	6	10.50	9.849	4.021	582	2.03	23.93
2804	78	10.964	8.400	.951	233	.82	34.07
2805	6	34.358	13.519	5.519	102	21.98	57.12
2807	422	89.334	30.664	1.493		36.00	339.00
2809	32	3.578	2.888	.5105	271	.72	16.88
2810	163	3.206	4.927	.386	907	.53	62.33
2811	138	3.576	1.846	.157	*	1.00	10.90
2813	18	13.632	8.983	2.117	193	3.77	39.53
2816	38	3.265	1.457	.236	82	.95	7.80
2817	24	5.225	4.464	.911	312	1.57	17.73
2820	122	8.915	5.848	.529	168	2.07	42.93
2821	36	5.862	2.417	.403	70	1.42	11.92

APPENDIX J

Combining Sherrod and HCSCIA Data

Data were combined using the formula:

$$M_c = n_s M_s + n_h M_h / n_s + n_h$$

where:

M_c = mean time for the combined data

n_s = sample size for the task from the Sherrod data

M_s = mean time for the task from the Sherrod data

n_h = sample size for the task from the HCSCIA data

M_h = mean time for the task from the HCSCIA data

1. 2406: Fetal electrode insertion, assisting physician*

$$M_c = (24)(3.5817) + (29)(4.4632) / 24 + 29 = 4.0640$$

* It is important to note a slight inaccuracy between this time and the time reflected for task 2406 in Appendix K. Due to the initial mislabeling of this task as 2405, the original combination of data reflected the HCSCIA data for this task but the Sherrod data for 2405. There is a difference in these times of .4507 minutes. Consequently the slightly higher time of 4.5147 was used to calculate total times. While this oversight is unfortunate, it is not believed that it had any appreciable effect in the final model. Furthermore, the higher time may have enhanced the potential predictive ability of the task. Even with the higher time used in the worksheet, the task did not remain in the regression solution.

2. 2408: Intrauterine catheter insertion, assisting physician

$$M_c = (6)(9.2133) + (27)(10.4858) / 6 + 27 = 10.2544$$

3. 2418: Perineal suture care

$$M_c = (10)(2.8530) + (20)(3.4167) / 10 + 20 = 3.2288$$

4. 2419: Teaching, perineal suture care

$$M_c = (24)(2.4383) + (47)(2.3291) / 24 + 47 = 2.3550$$

5. 2420: Teaching, breast care

$$M_c = (4)(2.8025) + (1)(3.6167) / 4 + 1 = 2.9653$$

6. 2426: Teaching, breast feeding

$$M_c = (16)(12.6888) + (14)(11.2595) / 16 + 14 = 12.0218$$

There were two additional tasks for which data were available from both Sherrod and HCSCIA. These were 2424--amniocentesis, assist physician and 2431--fetal electrode insertion/intrauterine catheter insertion, assisting physician. For both of these tasks, the variation between the times from the two sources was considerable. In both cases, the standard deviation relative to the mean was less in the HCSCIA data. Therefore, only the values derived by HCSCIA data collectors were used to express mean times for these two tasks despite having data from both sources.

APPENDIX K

Mean Times Used in the L&D Instruments

NOTE: Task numbers (e.g., 1.1) not in brackets are the variable labels used in the pilot test (see the worksheet in Appendix L). The numbers beside them in brackets are the variable labels used in the field test (see the worksheet in Appendix M) and the model testing.

VITAL SIGNS		MEAN TIME
1.1 [1.5]	Vital signs: T, P, R, B/P	2.3291
	Sum of Sherrod: 0808 = 1.2903 0801 = 1.0388	
1.2 [1.3]	Vital signs with manual uterine contraction and fetal assessment (no meds titration)	4.1607
	Combination of 1.1 = 2.3291 PLUS Average of Sherrod 2412 (1.4226) 2413 (2.1816) 2410 (1.8905) = 1.8316	
1.3 [1.1]	Vital signs with monitored uterine contraction and fetal assessment (no meds titration)	3.4152
	Combination of 1.1 = 2.3291 PLUS Sherrod 2409 = 1.0861	
1.4 [1.4]	Vital signs with manual uterine contraction and fetal assessment PLUS neuro assessment (no meds titration)	5.2458
	Combination of 1.1 = 2.3291 PLUS Average of Sherrod 2412 (1.4226) 2413 (2.1816) 2410 (1.8905) = 1.8316 PLUS Average of Sherrod 1104 (0.9941) 1105 (1.1761) = 1.0851	

Appendix K: Mean Times Used in L&D Instruments--continued

VITAL SIGNS--continued		MEAN TIME
1.5 [1.2]	Vital signs with monitored uterine contraction and fetal assessment PLUS neuro assessment (no meds titration)	4.5003
	Combination of 1.1 = 2.3291 PLUS Sherrod 2409 = 1.0861 PLUS Average of Sherrod 1104 (0.9941) 1105 (1.1761) = 1.0851	

MONITORING

2.1 [2.12]	Adjusting ultrasonic transducer/tocotransducer Sherrod 2435	2.9279
2.2 [2.1]	Admission or transfer in	34.6367
	Sum of Sherrod 1505 (9.2432) 1501 (3.5175) 2432 (5.2557) 0701 (4.7997) 0702 (1.7433) 0703 (1.0121) PLUS Worksheet tasks 1.1 2.4 2.12 PLUS Leopold maneuver time derived from 5 L&D clinical nurse experts	
2.3 [2.3]	Intake Sherrod 0208	0.8583
2.4 [2.5]	Maternal/fetal assessment, manual	1.8316
	Average of Sherrod 2412 (1.4226) 2413 (2.1816) 2410 (1.8905) = 1.8316	
2.5 [2.4]	Maternal/fetal assessment, monitored Sherrod 2409	1.0861

Appendix K: Mean Times Used in L&D Instruments--continued

MONITORING-continued		**MEAN TIME**
2.6 [2.6]	Output	0.9667
	Average of Sherrod 0301 (1.0877) 0303 (0.8456)	
2.7 [2.7a]	Recovery room assessment, initial -- general, spinal, or epidural anesthesia HCSCIA 2820 based on type anesthesia	13.6971
2.8 [2.7b]	Recovery room assessment, initial -- local or no anesthesia HCSCIA 2820 based on type anesthesia	7.8040
2.9 [2.8]	Recovery room assessment, follow-up	3.7004
	Average of HCSCIA 2800 2809 2811 2816 2817	
2.10 [2.9]	Recovery room, discharge HCSCIA 2821	5.8625
2.11 [2.10]	Second stage labor (if not in Delivery Room)	
	HCSCIA 2433: Primigravida = 62.9160 Multigravida = 24.9000	62.9160 OR 24.9000
2.12 [2.13]	Vaginal exam	1.8956
	Average of Sherrod 2403 (1.7765) 2404 (2.0146)	

Appendix K: Mean Times Used in L&D Instruments--continued

ACTIVITIES OF DAILY LIVING/FEEDING		MEAN TIME
3.1 [3.1]	Assisted ambulation (1:1) Sherrod 0401	5.1004
3.2 [3.2]	Assisted care	27.5992
	Sum of Sherrod 0102 (12.1010) 0110 (6.0472) 0103 (3.2428) 0202 (0.9525) 2432 (5.2557)	
3.3 [3.3]	Complete care	39.3133
	Sum of Sherrod 0101 (20.1646) 0109 (9.6977) 0103 (3.2428) 0202 (0.9525) 2432 (5.2557)	
3.4 [3.4]	Changing bed linen Sherrod 0111	3.4227
3.5 [3.5]	Changing bed linen protector/chux Sherrod 0118	1.0063
3.6 [3.6]	Changing patient's position Sherrod 0501	2.1266
3.7 [3.7]	Giving a bedpan Sherrod 0305	2.5998
3.8 [3.8]	Serving meal tray, preparation required Sherrod 0204	2.6070
3.9 [3.9]	Serving meal tray, no preparation Sherrod 0211	0.3881

Appendix K: Mean Times Used in L&D Instruments--continued

IV THERAPY		MEAN TIME
4.1 [4.1]	Blood product administration Average of Sherrod 1514 (3.7119) 1520 (3.5765)	3.6442
4.2 [4.2]	Change IV bottle and adjust flow rate Sum of Sherrod 1506 (1.6528) 1504 (0.7528)	2.4056
4.3 [4.3]	Discontinuing an IV infusion Sherrod 1510	3.2334
4.4 [4.4]	Infusion pump set-up Sherrod 1511	3.6533
4.5 [4.5]	IV catheter care Sherrod 1508	9.710
4.6 [4.6]	IV medication titration HCSCIA 2810	3.2005
4.7 [4.7]	Starting an IV Sherrod 1505	9.2432

TREATMENTS/PROCEDURES/MEDICATIONS		MEAN TIME
5.1 [5.1]	Amniocentesis HCSCIA 2424	13.6214
5.2 [5.2]	Amnioinfusion HCSCIA 2802	27.8611
5.3 [5.3]	Amniotomy Sherrod 2423	3.4025

Appendix K: Mean Time Used in L&D Instruments--continued

TREATMENTS/PROCEDURES/MEDICATIONS--continued	**MEAN TIME**
5.4 Delivery--MARK ONE ONLY	
HCSCIA 2415	
5.4a [5.4a] Vaginal, uncomplicated	
Primigravida = 116.568 (58.2840 x 2)	116.5680
Multigravida = 108.600 (54.3000 x2)	108.6000
5.4b [5.4b] Vaginal, complicated	
Primigravida = 155.520 (77.7600 x 2)	155.5200
Multigravida = 135.348 (67.6740 x 2)	135.3480
HCSCIA 2807	
5.4c [5.4c] C-section, scrub and circulate	
Primigravida = 161.796 (80.8980 x 2)	161.7960
Multigravida = 187.872 (93.9360 x 2)	187.8720
5.4d [5.4d] C-section, scrub only	
Primigravida = 80.8980	80.8980
Multigravida = 93.9360	93.9360
5.4e [5.4e] C-section, circulate only	
Primigravida = 80.8980	80.8980
Multigravida = 93.9360	93.9360
5.4f [5.4f] Not delivered by L&D staff = 0.0000	0.0000
5.5 [5.5] Dressing reinforcement	3.5442
Sherrod 1606	
5.6 [5.6] EKG--rhythm strip or 12-lead	9.0537
Average of Sherrod	
1010 (7.7785)	
1003 (10.3289)	
5.7 [5.7] Electrode insertion, fetal scalp	4.5147
HCSCIA and Sherrod 2406 (see Appendix J)	

Appendix K: Mean Times Used in L&D Instruments--continued

TREATMENTS/PROCEDURES/MEDICATIONS--continued		MEAN TIME
5.8 [5.8]	Electrode insertion, intrauterine pressure catheter HCSCIA and Sherrod 2408 (see Appendix J)	10.2544
5.9 [5.9]	Electrode insertion, both fetal & intrauterine catheter HCSCIA 2431	13.8848
5.10 [5.10]	Epidural anesthesia administration HCSCIA 2805	34.3583
5.11 [2.2]	Evaluation, labor room exam Sherrod 2434	26.0294
5.12 [5.11]	External fetal version HCSCIA 2803	10.5000
5.13 [5.12]	Fetal demise Sherrod 1621	22.8920
5.14 [5.13]	Fetal scalp sampling HCSCIA 2414	10.5611
5.15 [5.14]	IV Medication encounter Average of Sherrod 1507 (1.9933) 1509 (1.7653)	1.8793
5.16 [5.15]	Medication encounter, other than IV Average of Sherrod 2102 (0.8085) 2105 (1.2234) 2102 (1.2259) 2103 (0.9010) 2104 (1.4799)	1.1277

Appendix K: Mean Times Used in L&D Instruments--continued

TREATMENTS/PROCEDURES/MEDICATIONS--continued		MEAN TIME
5.17 [5.16]	Nipple stimulation contraction test HCSCIA 2813	13.6324
5.18 [5.17]	Non-stress test Sherrod 2422	24.3193
5.19 [5.18]	Perineal suture care HCSCIA and Sherrod 2418 (see Appendix J)	3.2288
5.20 [5.19]	Surgical prep Sherrod 1613	10.9932
5.21 [2.11]	Transducer application, both external and internal Sherrod 2432	5.2557
5.22 [5.2]	Ultrasound HCSCIA 2804	10.9639
5.23 [5.21]	Urinary catheterization Average of Sherrod 1901 (7.9674) 1902 (6.4924)	7.2299
5.24 [5.22]	Urine specimen collection encounter Sherrod 1905	2.0660
5.25 [5.23]	Venipuncture--Blood culture encounter Sherrod 1502	4.9744
5.26 [5.24]	Venipuncture--Blood sample encounter Sherrod 1501	3.5175

Appendix K: Mean Times Used in L&D Instruments--continued

RESPIRATORY THERAPY		MEAN TIME
6.1 [6.1]	Incentive spirometer Sherrod 1420	2.9668
6.2 [6.2]	Oxygen administration: initial and adjustments Average of Sherrod 1402 (0.9887) 1403 (0.8110)	0.8999

TEACHING AND EMOTIONAL SUPPORT		
7.1 [7.1]	Teaching: Breast care HCSCIA and Sherrod 2420 (see Appendix J)	2.9653
7.2 [7.2]	Teaching: Breast feeding HCSCIA and Sherrod 2426 (see Appendix J)	12.0218
7.3 [7.3]	Teaching: Perineal suture care HCSCIA and Sherrod 2419 (see Appendix J)	2.3660
7.4 [7.4]	Support during contractions (other than second stage of labor) Sherrod 2402	2.1680

APPENDIX L

Worksheet Used in the L&D Pilot Test

WORKLOAD MANAGEMENT SYSTEM FOR NURSING
LABOR AND DELIVERY WORKSHEET

RN _____ DATE _____

Time admitted to L&D _____
Time transferred to delivery room _____
Time transferred to recovery room _____
Time transferred to postpartum _____

Pertinent Patient Information
Gravida _____
Parity _____
Soc. Sec. No. _____

Activities	Counting Area	Total Number
Vital Signs		
1.1 Vital signs: T, P, R, B/P		
1.2 Vital signs with manual uterine contraction and fetal assessment (no meds titration)		
1.3 Vital signs with monitored uterine contraction and fetal assessment (no meds titration)		
1.4 Vital signs with manual uterine contraction and fetal assessment PLUS neuro assessment (no meds titration)		
1.5 Vital signs with monitored uterine contraction and fetal assessment PLUS neuro assessment (no meds titration)		
Monitoring		
2.1 Adjusting ultrasonic transducer/tocotransducer		
2.2 Admission or transfer in		
2.3 Intake encounter		
2.4 Maternal/fetal assessment, manual		
2.5 Maternal/fetal assessment, monitored		
2.6 Output encounter		
2.7 Recovery room assessment, initial -- general, spinal, or epidural anesthesia		OR
2.8 Recovery room assessment, initial -- local or no anesthesia		
2.9 Recovery room assessment, follow-up		
2.10 Recovery room, discharge		
2.11 Second stage labor (if not in Delivery Room)		
2.12 Vaginal exam		
Activities of Daily Living/Feeding		
3.1 Assisted ambulation (1:1)		
3.2 Assisted care		
3.3 Complete care		
3.4 Changing bed linen		
3.5 Changing bed linen protector/chux		
3.6 Changing patient's position		
3.7 Giving a bedpan		

HSC Form 564-R (TEST) (HCSCIA) 1 Oct 88

LABOR AND DELIVERY WORKSHEET (CONTINUED)

Activities	Counting Area	Total Number
3.8 Serving meal tray, preparation required		
3.9 Serving meal tray, no preparation		
IV Therapy		
4.1 Blood product administration		
4.2 Change IV bottle and adjust flow rate		
4.3 Discontinuing an IV infusion		
4.4 Infusion pump set-up		
4.5 IV catheter care		
4.6 IV medication titration		
4.7 Starting an IV		
Treatments/procedures/medications		
5.1 Amniocentesis		
5.2 Amnioinfusion		
5.3 Amniotomy		
5.4 Delivery--MARK ONE ONLY		
5.4a Vaginal, uncomplicated		OR
5.4b Vaginal, complicated		OR
5.4c C-section, scrub and circulate		OR
5.4d C-section, scrub only		OR
5.4e C-section, circulate only		OR
5.4f Not delivered by L&D staff		
5.5 Dressing reinforcement		
5.6 EKG--rhythm strip or 12-lead		
5.7 Electrode insertion, fetal scalp		
5.8 Electrode insertion, intrauterine pressure catheter		
5.9 Electrode insertion, both fetal & intrauterine catheter		
5.10 Epidural anesthesia administration		
5.11 Evaluation, labor room exam		
5.12 External fetal version		
5.13 Fetal demise		
5.14 Fetal scalp sampling		
5.15 IV Medication encounter		
5.16 Medication encounter, other than IV		
5.17 Nipple stimulation contraction test		

HSC Form 564-R (TEST) (HCSCIA) 1 Oct 88

LABOR AND DELIVERY WORKSHEET (CONTINUED)

Activities	Counting Area	Total Number
5.18 Non-stress test		
5.19 Perineal suture care		
5.20 Surgical prep		
5.21 Transducer application, both toco and ultrasonic		
5.22 Ultrasound		
5.23 Urinary catheterization		
5.24 Urine specimen collection encounter		
5.25 Venipuncture--Blood culture encounter		
5.26 Venipuncture--Blood sample encounter		
Respiratory Therapy		
6.1 Incentive spirometer		
6.2 Oxygen administration: initial and adjustments		
Teaching and Emotional Support		
7.1 Teaching: Breast care		
7.2 Teaching: Breast feeding		
7.3 Teaching: Perineal suture care		
7.4 Support during contractions (other than 2d stage of labor)		

Continuous

8.1 Activity requiring 1:1 (not documented elsewhere on this form)

Activity _____

Start clock time _____ End clock time _____

Number of Staff: RNs _____ Paraprofessionals _____

Reasons needing 1:1 staffing _____

8.2 Activity requiring greater than 1:1 (not documented elsewhere on this form)

Activity _____

Start clock time _____ End clock time _____

Number of Staff: RNs _____ Paraprofessionals _____

Reasons needing greater than 1:1 staffing _____

Comments: Please write any suggestions or questions you have regarding using this worksheet:

APPENDIX M

Worksheet Used in the L&D Field Test

WORKLOAD MANAGEMENT SYSTEM FOR NURSING LABOR AND DELIVERY WORKSHEET

SECTION I: General Information RN _____ DATE _____ SITE _____
(Signature of Nurse Finalizing Form)

SECTION II: Pertinent Patient Information Outpatient Only: ____ Yes No ____ (If No; fill out questions below)

Worksheet: ____ Initial **OR** Continuing ____
Gravida ____ Parity ____
Last four Soc. Sec. No. ____
Time Admitted to L & D ____
Time Transferred to Delivery Room ____ **OR** Time Discharged ____
Time Transferred to Recovery Room ____ Time Transferred to Postpartum ____

SECTION III: Activities

	Counting Area	Total No
VITAL SIGNS		
1.1 Vital signs with **MONITORED** uterine contraction and fetal assessment (no meds titration)		
1.2 Vital signs with **MONITORED** uterine contraction and fetal assessment **PLUS** neuro assessment (no meds titration)		
1.3 Vital signs with **MANUAL** uterine contraction and fetal assessment (no meds titration)		
1.4 Vital signs with **MANUAL** uterine contraction and fetal assessment **PLUS** neuro assessment (no meds titration)		
1.5 Vital signs: T, P, R, B/P		
MONITORING		
2.1 Admission or transfer in		
2.2 Evaluation, exam room		
2.3 Intake encounter		
2.4 Maternal/fetal assessment, **MONITORED**		
2.5 Maternal/fetal assessment, **MANUAL**		
2.6 Output encounter		
2.7 Recovery room assessment, initial -- **MARK ONE ONLY**		
2.7a General, spinal, or epidural anesthesia		OR
2.7b Local or no anesthesia		
2.8 Recovery room assessment, follow-up		
2.9 Recovery room, discharge or transfer out		
2.10 Second stage labor (if not in Delivery Room)		
2.11 Ultrasonic/tocotransducer, **APPLY**		
2.12 Ultrasonic/tocotransducer, **READJUST**		
2.13 Vaginal exam		
ACTIVITIES OF DAILY LIVING/FEEDING		
3.1 Assisted ambulation (1:1)		
3.2 Assisted care		
3.3 Complete care		
3.4 Changing bed linen		
3.5 Changing bed linen protector/chux		
3.6 Changing patient's position		
3.7 Giving a bedpan		
3.8 Serving meal tray, preparation required		
3.9 Serving meal tray, no preparation		
IV THERAPY		
4.1 Blood product administration		
4.2 Change IV bottle and adjust flow rate		
4.3 Discontinuing an IV infusion		
4.4 Infusion pump set-up		
4.5 IV catheter care		
4.6 IV medication titration		
4.7 Starting an IV		

WORKLOAD MANAGEMENT SYSTEM FOR NURSING LABOR AND DELIVERY WORKSHEET (CONT)

TREATMENTS/PROCEDURES/MEDICATIONS	Counting Area	Total No
5.1 Amniocentesis		
5.2 Amnioinfusion		
5.3 Amniotomy		
5.4 Delivery--**MARK ONE ONLY**		
5.4a Vaginal, uncomplicated		OR
5.4b Vaginal, complicated		OR
5.4c C-section, scrub and circulate		OR
5.4d C-section, scrub only		OR
5.4e C-section, circulate only		OR
5.4f Not delivered by L&D staff		
5.5 Dressing reinforcement		
5.6 EKG--rhythm strip or 12-lead		
5.7 Electrode insertion, fetal scalp		
5.8 Electrode insertion, intrauterine pressure catheter		
5.9 Electrode insertion, **BOTH** fetal & intrauterine catheter		
5.10 Epidural anesthesia administration		
5.11 External fetal version		
5.12 Fetal demise		
5.13 Fetal scalp sampling		
5.14 IV Medication encounter		
5.15 Medication encounter, **OTHER** than IV		
5.16 Nipple stimulation contraction test		
5.17 Non-stress test		
5.18 Perineal suture care		
5.19 Surgical prep		

TREATMENTS/PROCEDURES/ MEDICATIONS (CONT)	Counting Area	Total No
5.20 Ultrasound		
5.21 Urinary catheterization		
5.22 Urine specimen collection encounter		
5.23 Venipuncture--Blood culture encounter		
5.24 Venipuncture--Blood sample encounter		
RESPIRATORY THERAPY		
6.1 Incentive spirometer		
6.2 Oxygen administration: initial and adjustments		
TEACHING AND EMOTIONAL SUPPORT		
7.1 *Teaching: Breast care*		
7.2 Teaching: Breast feeding		
7.3 Teaching: Perineal suture care		
7.4 Support during contractions (other than 2d stage of labor)		

CONTINUOUS

8.1 Activity requiring 1:1 (not documented elsewhere on this form)

Activity _____

Start clock time _____ End clock time _____

Number of Staff: RNs _____ Paraprofessionals _____

Reasons needing 1:1 staffing _____

8.2 Activity requiring greater than 1:1 (not documented elsewhere on this form)

Activity _____

Start clock time _____ End clock time _____

Number of Staff: RNs _____ Paraprofessionals _____

Reasons needing greater than 1:1 staffing _____

Comments: Please write any suggestions or questions you have regarding using this worksheet on reverse:

BUNDLED TASKS AT A GLANCE

2 1 Admission or Transfer In
- o Maternal/fetal assessment including Leopold maneuvers
- o Nursing history
- o Orienting to unit
- o Starting an IV
- o Drawing admitting labs
- o Applying external monitors
- o Providing emotional support

2 7 Initial Recovery Room Assessment
(Choose a or b based on anesthesia type)
- o Getting report on patient
- o Evaluating IV infusions
- o Orienting to recovery area
- o Initial vital signs
- o Uterus assessment
- o Bladder assessment
- o Episiotomy assessment
- o Lochia assessment
- o DTRs if on mag sulfate
- o IF 2 7a--neuro checks or cough/deep breathe

2 8 Follow-Up Recovery Room Assessment
- o Vital signs other than first set
- o Uterus assessment
- o Bladder assessment
- o Episiotomy assessment
- o Lochia assessment
- o DTRs if on mag sulfate
- o IF spinal, general or epidural anesthesia--neuro checks or cough/deep breathe

2 9 Recovery Room Assessment, Discharge or Transfer Out
- o Final assessment of patient as indicated by 2 8
- o Remove IV if so ordered
- o Change into clean gown
- o Assist to wheelchair for discharge/transfer

3 2 Assisted Care
- o Assist with bath
- o Make unoccupied bed
- o Assist with oral hygiene
- o Bring fluids to bedside
- o Reapply external monitors
- o Maternal/fetal assessment

3 3 Complete Care
- o Bathe patient
- o Make occupied bed
- o Assist with oral hygiene
- o Bring fluids to bedside
- o Reapply external monitors
- o Maternal/fetal assessment

4 6 IV Medication Titration
- o Check infusion pump
- o Adjust IV flow rate
- o Maternal/fetal assessment
- o Vital signs

5 4a Vaginal, Uncomplicated Delivery
- o All activities that occur in the DR from the time of entry until the time of transfer to recovery in cases where the delivery is not complicated

5 4b Vaginal, Complicated Delivery
- o All activities that occur in the DR from the time of entry until the time of transfer to recovery in cases where the delivery is complicated While meconium and other signs of fetal distress are bothersome, they do not constitute a complicated delivery Complicated deliveries include those conditions that prolong time in delivery such as multiple births, breech presentation, third and fourth degree lacerations, hemorrhage, and uterine inertia

APPENDIX N

Elimination of Outpatient Tasks Based Upon a Logical Analysis

NOTE: The following nomenclature is derived from converting the task numbers on the field test worksheet at Appendix M to variable labels. For example, V12 is the variable label for task 1.2. The V simply signifies variable and the decimal point was dropped.

Tasks Never Selected

V12	V29	V38	V54A	V54E	V511	V61
V27A	V210	V41	V54B	V55	V512	V62
V27B	V32	V45	V54C	V57	V513	V71
V28	V33	V52	V54D	V510	V518	V72
					V519	V73

Tasks Selected Infrequently with Low Mean Times

TASK	Percent of Time NOT Selected	TASK	Percent of Time NOT Selected	TASK	Percent of Time NOT Selected
V13	99.5%	V39	99.1%	V522	87.3%
V14	99.8%	V42	99.7%	V523	99.9%
V21	99.7%	V43	99.5%	V524	94.9%
V23	96.5%	V44	99.3%	V62	99.8%
V24	97.6%	V46	99.3%	V74	98.7%
V25	99.9%	V47	99.4%		
V26	96.4%	V53	99.9%		
V31	98.8%	V56	99.9%		
V34	90.9%	V59	99.9%		
V35	96.9%	V514	99.3%		
V36	96.3%	V515	95.7%		
V37	99.4%	V521	96.8%		

Appendix N: Elimination of Outpatient Tasks Based Upon a Logical Analysis--continued

Tasks in the First Regression Model*

V11	V22	V212	V51	V517
V15	V211	V213	V516	V520

*It is important to recall that these numbers refer to the task numbers in brackets in Appendix K. They also correspond to the variables on the worksheet at Appendix M.

APPENDIX O

Summary of Outpatient Models Tested: Regression of Time on Tasks
($\underline{N}$ = 861)

NOTE: All models were tested and then validated using split-half samples. The total sample was divided using a computer-based random number generator. The test set was comprised of 412 cases, and the validation set was comprised of 449 cases. As noted in Appendix N, the variable nomenclature is derived from converting task numbers to variable labels (e.g., V11 is the variable label for task 1.1.

1. **First model: 10 logical tasks;**
   Adjusted R^2 = .98;
   Categorization accuracy = 99%

   a. V11 - Vital signs (VS) with monitored uterine contraction and fetal assessment (no med titration)

   b. V15 - VS: T, P, R, B/P

   c. V22 - Evaluation, exam room

   d. V211 - ultrasonic/tocotransducer, apply

   e. V212 - ultrasonic/tocotransducer, readjust

   f. V213 - vaginal exam

   g. V51 - amniocentesis

   h. V516 - nipple stimulation contraction test

   i. V517 - nonstress test

   j. V520 - ultrasound

2. **Second model: Ultrasimplistic**
   Categorization accuracy = 79%

In this model, an attempt was made to determine if something as simple as dichotomizing patients according to those with procedures and those without procedures would be sufficiently predictive as well as accurate. While such an approach would simplify the instructions to the users, the categorization accuracy was not acceptable.

Appendix O: Summary of Outpatient Models Tessted: Regression of Time on Tasks--continued

3. **Third model: 6 variables;**
Adjusted R^2 = .83;
Categorization accuracy = 97%

In the third model, the focus was on simplicity insofar as instructions to users were concerned. Therefore select items with low frequency counts were eliminated. This reduced the model by 3 variables: V11--vital signs with monitored uterine contraction and fetal assessment (no med titration); V15--vital signs: T, P, R, B/P; and V213--vaginal exam. In addition, V51--amniocentesis, while not requiring frequency counts, was also eliminated because it was done very infrequently. The low frequency of the task was recognized earlier (see Appendix N), but the task was included because it takes considerable time. Nevertheless, the task demonstrated little predictive ability and was consequently dropped.

4. **Fourth model: 5 variables;**
Adjusted R^2 = .77;
Categorization accuracy = 98%

For the fourth model, consideration was given as to how to enhance clarity for use in the clinical areas. For example, task V212, adjusting transducers, and task V211, applying transducers, are different and yet at a hurried glance they could be mismarked. Because this concept can be difficult to convey, the model was run without V212--ultrasonic/tocotransducer, readjust. Although the adjusted R^2 dropped to .77, only 14 patients were misclassified on the test set and only 6 patients were misclassified on the validation set. Despite this reduction in variance in total direct time accounted for, the R^2 still exceeded the regulatory value of .75 for a Type I standard. Furthermore, the accuracy of categorization was sustained thereby also supporting use of the smallest possible set of predictors of direct care time.

5. **Fifth model: 4 variables;**
Adjusted R^2 = .70;
Categorization accuracy = 97%

The goal of this model was to ascertain the effect of eliminating another frequency variable. Specifically, V211--ultrasonic/tocotransducer, apply--was dropped. While the R^2 dropped slightly, the categorization remained highly accurate. In consideration of the few remaining variables, one final model was run to simplify determining acuity categories.

Appendix O: Summary of Outpatient Models Tested: Regression of Time on Tasks--continued

6. **Sixth model: 4 variables;**
Adjusted R^2 = .70;
Categorization accuracy = 93%

This model approached establishing acuity categories by placing patients with one variable selected in category one, and those with more than one variable selected in category two. Despite the slightly low R^2, the high accuracy of categorization as well as the simplicity in the clinical setting made this model the preferred approach for outpatients. Furthermore, when the model was run using the total sample, the adjusted R^2 increased to .82.

THE VARIABLES REMAINING IN THE FINAL OUTPATIENT MODEL WERE:

- Exam room
- Nonstress test
- Nipple stimulation contraction test
- Ultrasound

APPENDIX P

Summary of Inpatient Models Tested: Regression of Time on Tasks
(N = 2301)

NOTE: As with the outpatients, all models were tested and then validated using split-half samples. The total sample was divided using a computer-based random number generator. The test set was comprised of 1197 cases, and the validation set was comprised of 1104 cases. As noted in Appendixes N and O, the variable nomenclature is derived from converting task numbers to variable labels (e.g., V11 is the variable label for task 1.1).

1. **First model: 42 indicators;**
   Adjusted R^2 = .99;
   Categorization accuracy = 91%

The initial reduction was much more difficult than with outpatients as all tasks could apply to inpatients. Through a logical analysis of frequencies and length of time per task, 28 of the original 70 tasks were eliminated. The 42 tasks used in the first model were:

V11	V27B	V213	V42	V54c	V510	V517
V15	V28	V31	V46	V54d	V511	V519
V21	V29	V32	V51	V54e	V513	V520
V22	V210	V33	V52	V57	V514	V521
V26	V211	V36	V54a	V58	V515	V72
V27a	V212	V37	V54b	V59	V516	V74

Appendix P: Summary of Inpatient Models Tested: Regression of Time on Tasks --continued

2. **Second model: 34 indicators;**
Adjusted R^2 =.97;
Categorization accuracy = 86%

Based on parameter estimates, tolerance limits, and p values, it was possible to eliminate 10 tasks that had been used in the first regression model. These were:

a. V22 - evaluation exam room

b. V26 - output encounter

c. V27A - initial recovery assessment; general, spinal, or epidural anesthesia

d. V27B - initial recovery assessment; local or no anesthesia

e. V212 - ultrasonic/tocotransducer, readjust

f. V51 - amniocentesis

g. V52 - amnioinfusion

h. V57 - electrode insertion, fetal scalp

i. V519 - surgical prep

j. V74 - support during contractions (not 2nd stage)

In addition, two variables were added. Of these, one was from the original worksheet tasks (V62--oxygen administration); it appeared to be the strongest possible candidate for correcting the patients who were misclassified. The second variable was gravida. It was on the original worksheet, but not as a task per se. Gravida was added as a categorical variable (GRAVCAT). There were two categories--those who were gravida one and those who represented any other value for gravida.

It is also important to note that the accuracy of categorization is less precise for the inpatient as compared with outpatients. This condition is to be expected considering that the distribution was more contiguous. By there not being clear cutpoints for forming categories, it is very easy for cases at the category boundaries to slip into either a higher or lower category because of just a few minutes of time. There is no way to preclude this occurrence and enhance the precision of the inpatient categorization. From a more positive perspective, the categorization accuracy is quite respectable. Furthermore, no case was miscategorized by more than one category in either direction which supports that the limited precision is from not having discrete cutpoints in the distribution.

Appendix P: Summary of Inpatient Models Tested: Regression of Time on Tasks --continued

3. **Third model: 31 variables;**
Adjusted R^2 = .97;
Categorization accuracy = 86%

There were two alterations made in this model as well. First, based upon tolerance values, one of the indicators was eliminated (V29--recovery room discharge or transfer out). Second, three vital sign parameters were combined into a new variable. The tasks combined were:

V11 - vital signs with monitored uterine contraction and fetal assessment (no meds titration)

V15 - vitals signs: T, P, R, B/P

V28 - recovery room assessment, follow-up

The combination of vital signs helped to reduce potential confusion among users regarding which vital sign area to mark. While V11 and V28 included care activities in addition to vital signs, the items were sufficiently similar in predictive ability to warrant combining them. The combination was accomplished by summing the times for each of the indicators and then taking their average. This resulted in the creation of a new indicator for vital signs in general (labeled as VSGN).

4. **Fourth model:**

The low tolerance value on task V54A--vaginal, uncomplicated delivery--was not expected. In discussing this occurrence, the idea surfaced that it might be possible to delete vaginal deliveries as predictors. This solution was totally unacceptable and the idea was abandoned.

Appendix P: Summary of Inpatient Models Tested: Regression of Time on Tasks --continued

5. **Fifth model: 25 variables;**
Adjusted R^2 = .97;
Categorization accuracy = 86%

Considering the lack of success with the fourth model, data from the third model guided development of the fifth. In the regression from the third model it was noted that parameter estimates for three tasks (V511--external fetal version; V515--medication encounter, other than IV; and V62-- O_2 administration: initial and adjustments) were statistically nonsignificant. In other words, the t-tests were not significantly different than zero. This suggested that the variance in these indicators was too high thereby reducing their usefulness as predictors of total direct time.

However the possibility of combining the two types of vaginal deliveries was then considered. Such a combination would also serve to reduce confusion among users; during the field test the staff had a difficult time dealing with the differences between complicated and uncomplicated vaginal deliveries. The vaginal deliveries were combined into a new variable labeled as VVAG. Similarly, the two C-section choices involving one provider each (V54D and V54E) were combined into a single variable--VCS1 (C-section, one provider, scrub or circulate).

Therefore, in model five, three variables were deleted, the two types of vaginal deliveries were combined into one variable as were C-sections with one provider. It is noteworthy that although 43 indicators were therefore eliminated from the original set of 68, the adjusted R^2 dropped by only .02, and the accuracy of classification dropped by only 5%.

THE VARIABLES REMAINING IN THE FINAL INPATIENT MODEL WERE:

V21	V33	V54C	V510	V520
V210	V36	VVAG	V513	V521
V211	V37	VCS1	V514	V72
V31	V42	V58	V516	VSGN
V32	V46	V59	V517	GRAVCAT

APPENDIX Q

Final L&D Patient Classification Worksheet

Stamp Plate

TODAY'S DATE ___/___/___ (Day / Month / Year)

USE THIS SECTION ONLY FOR OUTPATIENT ACTIVITIES

OUTPATIENT Activities

(Please "X" all that apply)

- ☐ Initial Patient Assessment
- ☐ Nipple stimulation contraction test
- ☐ Non stress test
- ☐ Ultrasound evaluation

WORKLOAD MANAGEMENT SYSTEM FOR NURSING - LABOR AND DELIVERY WORKSHEET

For use of this form, see HSC Suppl 1 to AR __; proponent is ___

INPATIENT Activities

Pertinent INPATIENT Information

Gravida_____ Para _____

Admission / Transfer _____ *Date* _____ *Time*

Worksheet: # _____

One-Time INPATIENT Activities

(Please "X" all that apply)

- ☐ Admission or transfer
- ☐ Assisted care
- ☐ Complete Care
- ☐ Second stage labor support
- ☐ Vaginal Delivery
- ☐ C-section, circulate and scrub
- ☐ C-section, circulate or scrub

RN INITIALS

N_____ D_____ E_____

Discharged /Transferred _____ *Date* _____ *Time*

Multiple Occurring INPATIENT Activities

(Please "tick" mark each time done)

	Counting Area	Total No
1. Assisted ambulation		
2. Bedpan assistance		
3. Breast feeding, teaching		
4. Epidural anesthesia, initial		
5. Fetal scalp sampling		
6. Insertion, fetal scalp & IUPC		
7. Insertion, IUPC		
8. IV bottle change		
9. IV medication encounter		
10. IV medication titration		
11. Nipple stimulation test		
12. Non-stress test		
13. Position change, assist		
14. Ultrasonic/tocotransducer application		
15. Ultrasound		
16. Urinary catheterization		
17. Vital signs		

HSC Form 564-R (TEST) (HCSCIA) 1 Jan 90

WORKLOAD MANAGEMENT SYSTEM FOR NURSING - LABOR AND DELIVERY WORKSHEET (REVERSE)

For use of this form, see HSC Suppl 1 to AR __; proponent is ___

BUNDLED TASKS AT A GLANCE

Initial Patient Assessment (for outpatients only)

- o Nursing history
- o Review outpatient chart
- o Urine specimen
- o Weigh patient
- o Position on exam table
- o Baseline maternal / fetal assessment
- o Notify physician / CNM of patient's presence
- o Vaginal exam
- o Apply external monitor per unit SOP
- o Monitor as indicated

Admission or Transfer In

- o Maternal / fetal assessment including Leopold maneuvers
- o Nursing history
- o Orienting to unit
- o Starting an IV
- o Drawing admitting labs
- o Applying external monitors
- o Providing emotional support

Assisted Care

- o Assist with bath
- o Make unoccupied bed
- o Assist with oral hygiene
- o Bring fluids to bedside
- o Reapply external monitors
- o Maternal / fetal assessment

Complete Care

- o Bathe patient
- o Make occupied bed
- o Assist with oral hygiene
- o Bring fluids to bedside
- o Reapply external monitors
- o Maternal / fetal assessment

Second Stage Labor Support

(NOTE: Applies only to events in labor room. Do not mark if second stage occurs in delivery room or if second stage lasts only moments before the patient moves to the delivery room)

- o A member of the nursing staff remains in constant attendance
- o Evaluate contractions
- o Assess fetal heart tones
- o Encourage proper breathing and bearing down efforts

IV Medication Titration

- o Check infusion pump
- o Adjust IV flow rate
- o Maternal / fetal assessment
- o Vital signs

APPENDIX R

Tasks Predictive of L&D Outpatient Total Direct Care Time and Their Associated Beta Weights

(4 TASKS)

TASK	BETA WEIGHT
o Initial patient assessment	25.04
o Nipple stimulation contraction test	15.63
o Non-stress test	26.29
o Ultrasound evaluation	10.70
Intercept	5.28

APPENDIX S

Tasks Predictive of L&D Inpatient Total Direct Care Time and Their Associated Beta Weights

(25 TASKS)

	TASK	BETA WEIGHT
	One-Time INPATIENT Activities	
o	Gravida	10.93
o	Admission or transfer	49.53
o	Assisted care	28.95
o	Complete care	45.97
o	Second stage labor support	43.94
o	Vaginal delivery	144.33
o	C-section, circulate and scrub	117.19
o	C-section, circulate or scrub	201.98
	Multiple Occurring INPATIENT Activities	
1	Assisted ambulation	6.33
2	Bedpan assistance	3.28
3	Breast feeding, teaching	13.05
4	Epidural anesthesia, initial	33.61
5	Fetal scalp sampling	14.23
6	Insertion, fetal scalp & IUPC	19.34
7	Insertion, IUPC	18.25
8	IV bottle change	4.47
9	IV medication encounter	3.94
10	IV medication titration	3.17
11	Nipple stimulation test	11.94
12	Non-stress test	24.49
13	Position change, assist	5.95
14	Ultrasonic/tocotransducer application	8.93
15	Ultrasound	11.85
16	Urinary catheterization	14.75
17	Vital signs	3.62
	Intercept	7.17

APPENDIX T

Guidelines for Using the L&D Worksheet

GUIDELINES FOR USING THE WORKLOAD MANAGEMENT SYSTEM FOR NURSING - LABOR AND DELIVERY (WMSN - L&D) WORKSHEET

A. INTRODUCTION

The Labor and Delivery Worksheet is used for annotating outpatient and inpatient direct nursing care activities as they occur. This information will be used to classify patients into categories of care according to acuity. There are three general sections on the form. The first provides space for the patient's stamp plate and the current date. Either the inpatient or outpatient stamp plate may be used. The second major section pertains only to outpatients. The last and most lengthy section concerns inpatients. It has three parts: a) pertinent inpatient information; b) one-time inpatient activities; and c) multiple occurring inpatient activities. In addition, at the bottom of the form, there are spaces for an RN to initial the form after each shift. There is also a space to note the date and time inpatients leave the L&D area.

B. GENERAL GUIDELINES FOR USE

B1. **Initiating the Worksheet:** All patients, both outpatients and inpatients, receiving nursing care in Labor and Delivery (L&D) units will have a Workload Management System for Nursing - Labor and Delivery (WMSN - L&D) worksheet initiated. An L&D staff member must ensure that this worksheet is started at the time the patient begins to receive care in L&D. The worksheet should be placed near the patient so that **ALL** nursing personnel can easily mark the appropriate activities **as the tasks are completed.** If the patient changes location within the L&D area, the worksheet should be relocated so that it remains with the patient until she is transferred to another unit or discharged from L&D.

B2. **Completing the Worksheet:** In the upper left hand corner, identify the form with the patient's stamp plate. For outpatients you only need to complete the outpatient activities section. Inpatients must have the three parts of the inpatient activities section completed. These are pertinent information, one-time activities, and multiple occurring activities.

All nursing personnel must mark the activities as they occur. If a care provider is either a student or an orientee, an assigned nursing staff member should explain and review the form with the new care provider so that they can record the activities as they occur.

When the patient is discharged or transferred from the L&D area, the staff must note the date and time the patient left in the space so labeled. If a patient receives care in L&D as an outpatient and then becomes an inpatient, continue to record the inpatient care on the same sheet.

An RN must review the worksheet at the end of each shift to verify the accuracy and completeness of the marked activities. Upon completing the review, the RN will initial in the space next to the appropriate shift.

B3. **Finalizing the Worksheet:**

A worksheet is to be finalized in any one of three instances:

a. When an outpatient visit is terminated and the patient is **NOT** admitted to L&D.

b. When an inpatient is discharged or transferred from L&D.

c. At midnight (2400 hours) each day for patients remaining in L&D.

The worksheet must be removed from the patient record at the time of discharge or transfer. It must be placed in the identified collection area so that the the head nurse or their designee can complete the total number column. The total number column is completed only once a day. If the RN is the person totaling the marks, this could be done at the time the sheet is finalized, and no collection area will be needed. Once finalized, the worksheet is to be stored at a location designated by the head nurse.

C. SPECIFIC INSTRUCTIONS FOR USE

C1. The patient's stamp plate must be imprinted and the current date must be completed for any patient receiving nursing care in L&D. Each shift, an RN must review and initial the sheet in the appropriate space to indicate that the information was reviewed and is correct.

C2. **Outpatient Activities:** This section is to be completed for any outpatient who receives nursing care in the L&D unit. Place a mark in any of the four boxes that correspond to nursing care activities that were completed. **For outpatients only,** mark all nursing activities pertaining to each visit on one sheet, even if if the visit extends past midnight. The date at the top of the form would be the date when the patient began receiving outpatient care.

For outpatients who are admitted, continue to use the same sheet on the day of admission to reflect inpatient care. See the specific instructions for inpatients regarding how to complete the inpatient section.

For outpatients who are sent walking, keep the sheet active until a decision is made as to whether the patient will be admitted or sent home. If a patient was seen as an outpatient earlier in the day and then returns to L&D, a new sheet should be initiated. Activities should be marked only when they are completed as defined, however. For example, a patient may be seen as an outpatient and have an initial patient assessment completed. If the patient leaves and returns, the initial patient assessment would be marked only if the entire assessment is done again. If only a vaginal exam is completed, no marks would be made. If one of the other procedures such as an ultrasound is done, it would be marked.

C3. **Inpatient Activities--Pertinent Inpatient Information.** For all patients admitted to L&D, complete:

a. Patient's gravida and para.

b. Date/time of admission or transfer. Indicate the date the patient was admitted to L&D. Using military time, also indicate the time the patient was admitted to L&D. This applies to all sheets. In the case of serial inductions, date and time transferred in refers to the date and time the patient was received on L&D for the particular induction, not the date and time of the hospital admission. For these patients as well as patients in preterm labor who might transfer back and forth from postpartum to L&D, it is possible that several sheets might be done on the same patient, with a new sheet started each time the patient transfers into L&D.

c. Worksheet #. If the sheet is the first worksheet for that transfer in or admission, place a 1 (one) in the space. For each subsequent day that is a continuation of the same stay in L&D, simply place the corresponding number in the space. For example, the second day of the stay would be noted by a 2 (two), the third day a 3 (three), etc. A new sheet is started for all inpatients remaining in L&D past 2400 hours. The professional nurse is responsible for starting this form. It can be initiated when the evening nurse completes the review of the form for accuracy and completeness. At the time a new sheet is initiated, it is important to complete both the date and time of admission/transfer information as well as to record the proper sheet number in the worksheet # space.

C4. **Inpatient Activities--One-Time Inpatient Activities.** This section is completed only for patients admitted to the L&D unit. It includes activities that occur only once. Place a mark in each box that corresponds to direct nursing care activities performed.

C5. **Inpatient Activities--Multiple Occurring Inpatient Activities.** This section is completed only for patients admitted to the L&D unit. It includes nursing care activities that may occur more than once. Place a mark in the gray shaded counting area corresponding to the specific activity each time the activity is completed. Grouping multiple marks in sets of five will facilitate counting. The person designated by the head nurse will sum the marks for each activity and write a total in the "Total No" column.

C6. **Date/Time Discharged/Transferred.** Using military time, indicate the time the patient was either discharged or transferred to another unit or hospital. This item will remain blank for all patients continuing to receive care.

WORKLOAD MANAGEMENT SYSTEM FOR NURSING - LABOR AND DELIVERY WORKSHEET

TASK OPERATIONAL DEFINITIONS

OUTPATIENT ACTIVITIES

Initial Patient Assessment - Includes time to obtain nursing history from the patient and complete a systems review, review outpatient chart, obtain a urine specimen and analyze it for protein and glucose, obtain weight, position on examination table, obtain baseline maternal and fetal assessment, notify the physician or Certified Nurse Midwife (CNM) of the patient's presence, perform or assist with vaginal examination, continue to monitor as necessary.

Nipple Stimulation Contraction Test - Includes time to set patient up as for a a non-stress test, explain procedure to patient, teach and monitor nipple stimulation technique per unit protocol, obtain baseline fetal and maternal assessment, begin the test with monitoring according to unit protocol; when test is completed, detach patient from monitor.

Non-Stress Test - Includes time to set up equipment at bedside, explain and demonstrate procedure to patient, assess baseline vital signs and fetal heart tones, fetal movement, and uterine activity.

Ultrasound Evaluation - Includes time to explain procedure to patient, place equipment at bedside, assist physician with procedure, remove equipment from bedside. (NOTE: Do not mark this procedure if the physician does the task independently without assistance from the nursing staff).

ONE-TIME INPATIENT ACTIVITIES

Admission or Transfer - Includes time for the spectrum of admission assessment and orientation activities. These include establishing the nursing data base (maternal/fetal assessment including Leopold maneuvers, vital signs, and nursing history), orienting the mother and significant other to the unit, starting an IV, drawing baseline blood work, applying external monitors, and providing initial emotional support.

Assisted Care - Includes time to assist patient with bath (place equipment at bedside, remove pajamas, allow for patient bathing, change water, bathe back and lower extremities if patient is unable to, replace pajamas and remove equipment from area);

AND

Make unoccupied bed (includes time to place linen at bedside, remove soiled linen, place bottom sheet on mattress, then place top sheet, change pillow cases, remove soiled linen from area);

AND

Assist patient with oral hygiene (includes time to place equipment at bedside and remove equipment when patient has completed mouth care);

AND

Bring fluids to the bedside (includes time to place fluids at bedside, set water pitcher and glass/straw within reach, and depart from the area);

AND

Reapply external monitors

AND

Complete a maternal/fetal assessment

Complete Care - Includes time to bathe patient (place equipment at bedside, remove pajamas, bathe face, chest, abdomen and extremities, change water, bathe back, buttocks and perineal area, replace pajamas, and remove equipment from area);

AND

Make an occupied bed (includes time to place linen at bedside, turn patient on side, roll linen to one side of bed, replace with clean linen, turn patient to freshly made side of bed, remove soiled linen and complete bed making, then remove soiled linen from area);

AND

Assist patient with oral hygiene (includes time to place equipment at bedside, cleanse gums, teeth, and mouth, and remove equipment when mouth care is completed);

AND

Bring fluids to the bedside (includes time to place fluids at bedside, set water pitcher and glass/straw within reach, and depart from the area);

AND

Reapply external monitors

AND

Complete a maternal/fetal assessment

Second Stage Labor Support - Includes time from when complete dilatation of the cervix occurs until patient is ready to be transferred to the delivery room. A member of the nursing staff remains in constant attendance to evaluate amplitude, duration, and frequency of each contraction, assess fetal heart tones and to encourage proper breathing and bearing down efforts **(NOTE: This applies to the Labor Room only; do not mark if second stage occurs in Delivery Room. Also do not mark is second stage lasts only moments before the patient moves to Delivery or a nurse is not in attendance to provide coaching).**

Vaginal Delivery - Includes time to assist with complicated or uncomplicated vaginal delivery per unit SOP.

C-Section, Circulate **AND** Scrub - Includes time for two L&D staff members to perform both circulating and scrubbing duties per unit SOP.

C-Section, Circulate **OR** Scrub - Same as C-Section, Circulate **AND** Scrub except that L&D staff are involved only in scrubbing OR circulating for the procedure.

MULTIPLE OCCURRING INPATIENT ACTIVITIES

1. Assisted Ambulation - Includes time to place IV solution on rolling pole (if patient has an IV), assist patient into a sitting position on side of bed, then into an upright standing position, then with ambulation to the bathroom and back to bed, and reposition back in bed.

2. Bedpan Assistance - Includes time to place bedpan at bedside, place patient on bedpan, provide toilet tissue, remove patient from bedpan, cover bedpan, provide for patient hygiene, and remove bedpan from area.

3. Breast Feeding Teaching - Includes time to provide instructions on the technique of breast feeding; observe and assist mother during the feeding process to assess proper technique.

4. Epidural Anesthesia, Initial Set-Up - Includes time to explain procedure to patient, place equipment at bedside, assess baseline vital signs as well as maternal and fetal status, assist physician with insertion of the epidural catheter and anesthetic agent, assess and monitor vital signs, fetal heart tones, and uterine activity, remove equipment from area, continue monitoring vital signs, fetal heart tones and uterine activity, initiate neuro checks if warranted.

5. Fetal Scalp Sampling - Includes time to explain procedure to patient, set up equipment at bedside, assess baseline fetal heart tones, position patient, assist physician with procedure, mark monitor strip, monitor and assess fetal heart tones, label blood samples, then remove used equipment from area.

6. Insertion, Fetal Scalp and IUPC - Includes time to explain procedure to patient, set up equipment at bedside, position patient, zero and calibrate monitor, flush catheter with sterile water, assist physician with the insertion of fetal electrode and intrauterine catheter, secure catheter and electrode, connect monitoring equipment, assess and record fetal heart rate, mark monitor strip, then remove used equipment from area.

7. Insertion, IUPC - Includes time to set up equipment at bedside, position patient, assist physician with the insertion of the intrauterine pressure catheter, connect monitoring equipment, flush catheter with sterile water, zero and calibrate monitor, mark monitor strip, then remove used equipment from the area.

8. IV Bottle Change - Includes time to place equipment at bedside, remove used IV container and replace with new IV container, calculate and adjust flow rate, and remove equipment from area.

9. IV Medication Encounter:

IV Push: Identify patient, place equipment at bedside, select site for injection of solution using existing system, administer IV solution, and remove equipment from area;

OR

Piggy-Back: Identify patient, place equipment at bedside, select site for administration of solution using existing system, initiate infusion, record on Intake and Output Record, and remove equipment from area.

10. IV Medication Titration - Includes time to check infusion pump operation and IV flow rate, make flow rate adjustments, and assess maternal/fetal response to include vital signs. (**NOTE: This task applies to initiating titratable drugs such as pitocin, ritodrine, and magnesium sulfate as well as the titration procedure that occurs while the drugs are in use**).

11. Nipple Stimulation Test - Includes time to set patient up as for a non-stress test, explain procedure to patient, teach and monitor nipple stimulation technique per unit protocol, obtain baseline fetal and maternal assessment, begin the test with monitoring according to unit protocol; when test is completed, detach patient from monitor.

12. Non-Stress Test - Includes time to set up equipment at the bedside, explain and demonstrate procedure to patient, assess baseline vital signs and fetal heart tones, fetal movement, and uterine activity.

13. Patient Position Change, Assistance - Includes time to remove support pillows, reposition patient, and reapply support pillows.

14. Ultrasonic/Tocotransducer Application - Includes time to position patient, expose abdominal area, apply tocotransducer and ultrasonic transducer, connect to monitoring equipment, assess status of contractions and fetal heart tones and depart area.

15. Ultrasound - Includes time to explain procedure to patient, place equipment at bedside, assist physician with procedure, remove equipment from bedside. (NOTE: Do not mark this procedure if the physician does the task independently without assistance from the nursing staff).

16. Urinary Catheterization:

Indwelling - Includes time to place equipment at bedside, prepare patient and insert indwelling urinary catheter, inflate balloon, tape catheter in position, connect to urinary drainage bag; then remove used equipment from area.

OR

Straight- Includes time to place equipment at the bedside, prepare patient and insert urinary catheter, empty bladder and remove straight catheter; then remove used equipment from area.

17. Vital Signs:

T, P, R, and B/P - Includes time to place equipment at bedside, position temperature probe or thermometer, assess respiratory rate, take pulse, place cuff around extremity, position stethoscope, measure blood pressure, remove cuff, record results of measurements, and remove equipment from area.

OR

P, R, and B/P - Includes time to place equipment at bedside, assess respiratory rate, take pulse, place cuff around extremity, position stethoscope, measure blood pressure, remove cuff, record results of measurements, and remove equipment from area.

DISTRIBUTION LIST

HQDA (DASG-CN), Room 623, Skyline Five, 5111 Leesburg Pike, Falls Church, VA 22041-3258 (2)

Defense Technical Information Center, DTIC, ATTN: DTIC-OCC, Cameron Station, Alexandria, VA 22304-6145 (2)

Director, Joint Medical Library, DASG-AAFJML, Offices of the Surgeons General, Army/Air Force, Room 670, 5109 Leeburg Pike, Falls Church, VA 22041-3258 (1)

Stimson Library, Academy of Health Sciences, Bldg. 2840, Fort Sam Houston, TX 78234-6000 (1)

Defense Logistics Studies Information Exchange, U.S. Army Logistics Management College, ATTN: ATSZ-DL, Fort Lee, VA 23801-6043 (1)

HQDA, (SGPS-CP-N), Room 603, Skyline Five, 5111 Leesburg Pike, Falls Church, VA 22041-3258 (1)

HQDA, (DASG-HCM) OTSG Manpower Program Division, Room 557, Skyline Five, 5111 Leesburg Pike, Falls Church, VA 22041-3258 (1)

JMO, OASD (HA), ATTN: HSO/OMS, The Pentagon, Room, 3E-343, Washington, DC 20301-1200 (1)

HQ HSC, ATTN: HSPA-N, Fort Sam Houston, TX 78234-6000 (1)

HQDA (DASG-HCD-S), 5109 Leesburg Pike, Falls Church, VA 22041-3258 (1)